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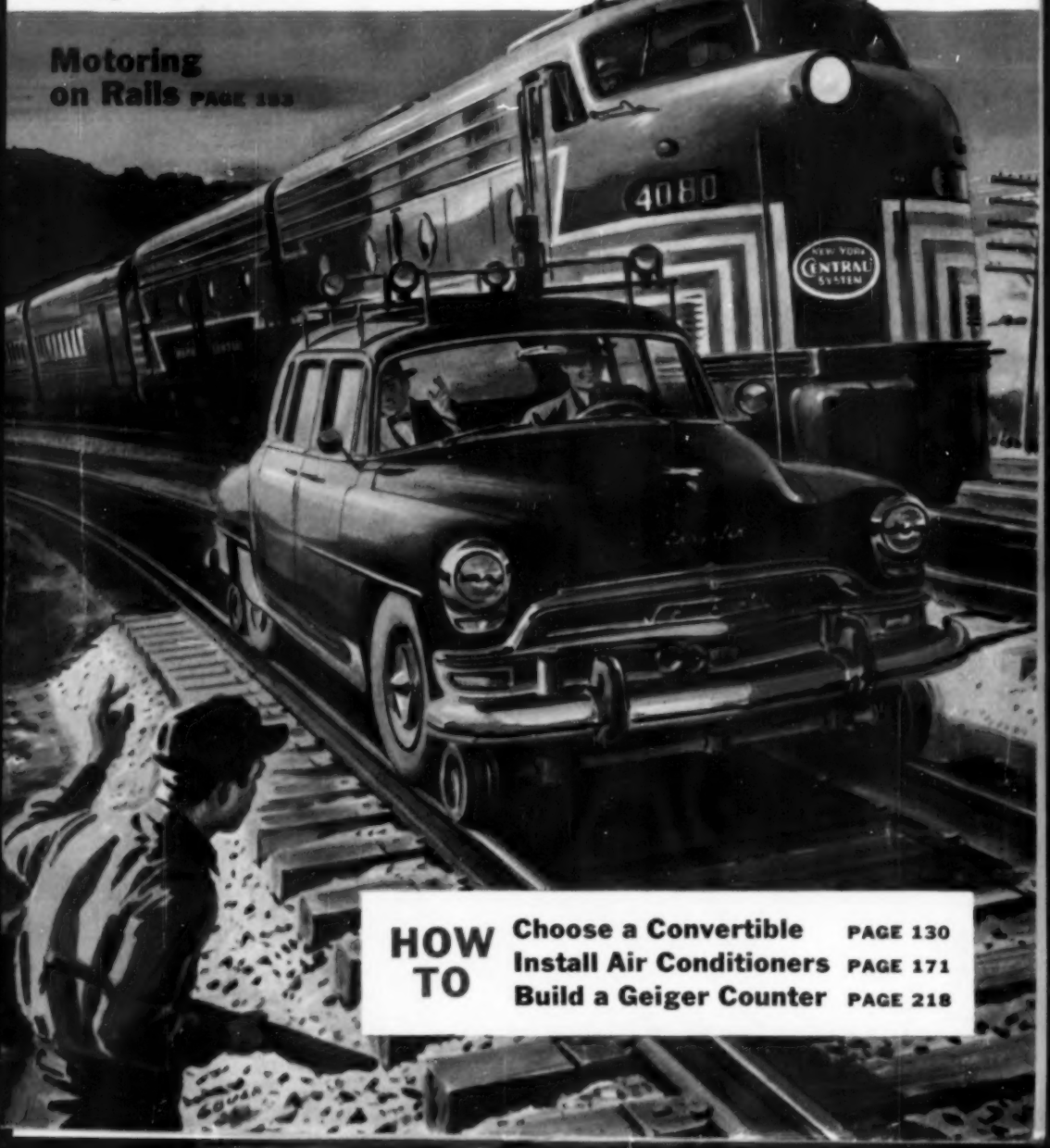

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EDITORIAL OFFICES: 353 Fourth Avenue, New York 10, N. Y.

Published monthly at 353 Fourth Avenue, New York 10, N. Y., by Popular Science Publishing Co., Inc., Godfrey Hammond, President; Stephen P. Glennon, Vice-President and Secretary; Ralph H. Flynn, Vice-President and Treasurer; F. W. Briggs, Eugene Watson, Vice-Presidents. Entered as second-class matter Dec. 28, 1918, re-entered as second-class matter July 26, 1948, at the Post Office in New York, N. Y., under the act of March 3, 1879; additional entry as second-class matter at Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U.S.A. Copyright, 1955, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all the countries participating in the International Copyright Convention and Pan-American Copyright Convention. Yearly subscriptions to United States, its possessions and Canada, $3.40 (2 years, $6.00; 3 years, $8.00); foreign countries $1 per year extra. Four weeks' notice is needed to change a subscriber's address. Please give both old and new addresses, including postal zone numbers.

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Quick—Easy—Convenient To Use! Just Dab On Your Favorite Bait, Drop In Water And Fish As Usual!

Are you down on your fishing luck? Have you been coming home recently with an empty creel? Have you invested hard earned cash on the latest fishing tackle, fancy lures and bait—only to be frustrated time after time? No matter how unlucky you've been, this new discovery may change all that—quickly! Now, at last, you too can use a secret that professionals have tried with astounding results—a secret that even a schoolboy can use to catch more fish, no matter what the weather, bait or tackle. Yes, you can even get big ones out of what the misinformed call "fished-out" waters. And you can do it with your present fishing methods and equipment! No need for special bait . . . whether you fish in a river, lake, pond or the open sea . . . whether you cast, spin, troll or do still-fishing . . . this new discovery will give you the thrill of your life!

SCIENTISTS DISCOVER STRANGE HABITS OF SEA LIFE

Man has been fishing since the dawn of time. Yet during countless centuries he's never really known much about sea life. Then leading scientists from all over the world got on the job, including the U. S. Dept. of Fisheries. Ichthyologists, chemists, zoologists and sportsmen joined in the quest. Millions of dollars were spent on gigantic glass aquariums, sub-marine cameras, recording devices and lab equipment. In less than a generation man learned more about the mysteries of sea life than in the previous 10,000 years!

EXPERIMENTS PROVE FISH ARE ALMOST BLIND

Here is the most startling discovery that the scientists unearthed: most fish—of ALL species—have very poor eyesight compared to birds and mammals. Some are almost blind! No wonder, then, that you can use the most attractive dry lures—yet go home after a day's fishing excursion with little to show for it but a sunburn!

It doesn't make much difference how good the bait is you use nor how hungry a fish may be—if he doesn't SEE it, if he isn't DRAWN to it, you won't get a nibble! And test after test proved that unless you get the lure right under the fish's nose, you simply cannot attract him to your hook!

NEW SEX-HUNGER FISH LURE DEVELOPED BY GERMAN CHEMIST

The new **Lurene** formula was developed by a German chemist, a graduate of the University of Tubingen in Wurtemburg, Germany. An acknowledged leader in his profession, he knew that certain lures and bait failed simply because many fish were nearly blind. But he learned that Mother Nature in her bounty provided fish with extra powerful sense-instincts that led them irresistibly to their food supply. This sense-instinct for want of a better name may be called **Smell-Taste**. In other words, a fish both **SMELLS** and **TASTES** at one and the same time! For this purpose, the bodies of fish are covered with thousands upon thousands of tiny smell organs—without which life would be impossible. Armed with this knowledge, the eminent chemist finally developed the now famous **Lurene** formula.

NOW!—SEX FACTOR ADDS EXTRA "PUNCH"

Scientists have long known that the sex factor is one of the most compelling instincts in sea life. Fish go to fantastic lengths to fertilize their eggs. They travel countless miles to fertilize them—go through incredible torture, accomplish almost impossible tasks. One of the most wondrous sights of nature is to watch male salmon struggle up river fish-ladders to fertilize the spawn. NOW—for the first time ever—natural sex hormones have been added to the new **Lurene** formula. This has increased production costs considerably—but you'll agree after using it that it's certainly worth it! And it's SO easy to use—just dab a little on the plug or bait, drop it in the water and fish as usual. LURENE works in lakes, streams, ponds or in the ocean. It makes no difference if you still-fish, troll, cast or spin. **Lurene** disperses in the water, giving you greater **penetration**, longer **range** and far more **attraction power**.

TEST IT YOURSELF THIS EASY WAY!

No elaborate equipment required! An ordinary glass aquarium tank and ANY species of fish will prove this new method really works! Drop in 2 or 3 lines with your favorite bait. Treat only ONE with the new LURENE "triple-instinct" preparation. It's the same bait . . . the same lures . . . yet right there before your eyes you'll be witnessing a fascinating spectacle! You'll hardly believe your eyes! The fish, as if compelled by some unknown power are drawn to the Lurene-treated line. This article explains how this "triple-instinct" in fish can increase your fishing luck.

RESULTS GUARANTEED OR IT DOESN'T COST YOU 1c

Now you can try **Lurene** at our risk! It **must** help you catch **more** fish—**faster**! **Lurene** must prove to be the **best** scent lure you've ever used—or your money back! You're invited to try it without obligation. We want you to see for yourself how **Lurene** releases its deep, penetrating "call" into the surrounding waters. See how the mysterious instincts of the sea world help attract fish to your hook. **And**—of this you can be sure: **Lurene really works**—it positively helps draw 'em in! So we say: **try** it and judge for yourself. See if you don't get the big ones—even in "fished-out" waters! Use it to pull in your favorites . . . trout, pickerel, catfish, blues, weaks, pike, perch, bass, snappers, porgies. You need send no money now. Simply deposit 1.98 plus postage with your mailman when the **Lurene** arrives—or mail 1.98 now for immediate prepaid shipment. But please remember: you're **trying**—not buying! Unless you're satisfied in every way with this new, different product, it won't cost you a penny. **rush** the coupon now while supplies are available to:

LURENE CO., Dept. 7-E-10
352 Fourth Ave., New York 10, N.Y.

FAMOUS SPORTS EDITOR PRAISES LURENE FORMULA

Millions of readers follow Walter S. Miller's sports column, "Rod, Gun & LENS," which appears in over 15 metropolitan newspapers. He tests new products thoroughly, warning readers against shoddy, defective articles but also giving praise where praise is due. This is what this great sports authority says about LURENE:

"Recently a product called 'Lurene', a prepared bait oil came into my possession with instructions to test it and pass on my opinion to you. Accordingly here are the results on several such tests.

"Using an artificial lure of the spoon type in salt water the number of casts per fish was 27. With 'Lurene' the number of casts per fish was 9. Accordingly this product is active enough to salt water fishermen since tests prove it will triple your catch regardless of type of fish. "Again using an artificial lure of the spinner type in fresh water the number of casts per fish was 50. Using 'Lurene' the number of casts per fish was reduced to the phenomenal low of 10 casts per fish. The results proved beyond doubt that in fresh water 'Lurene' quintupled the catch. I heartily endorse this product."

Change Your Fishing Luck—Mail Coupon Today!

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Rush—1.98 packages of **Lurene** on 5-day Free Trial. It is guaranteed—the formula **must** help me catch more fish. It must give me thrilling results. Otherwise, you will refund my 1.98—no questions asked.

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☐ **Send C.O.D. plus postage.**

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3 WAYS G-E *All-Weather* HEADLAMPS MAKE NIGHT DRIVING SAFER THAN EVER BEFORE

1. HELP YOU SEE THROUGH FOG, RAIN, SNOW. Compare the actual photos above. Obstacles you can hardly see with ordinary headlamps (top photo) are clearly visible with new General Electric *All-Weather* Headlamps (bottom photo). Here's why:

With ordinary headlamps, some of the direct light from the filament shines upward in front of the windshield. The fog then mirrors it back into the driver's eyes as *glare*. His vision is reduced.

New G-E Filament Shield

But with G-E *All-Weather* Headlamps, a built-in filament shield blocks off this uncontrolled upward light. The main beam is not affected. Result: *much* better visibility in fog, rain and snow.

2. HELP YOU SEE THE ROAD AGAINST ONCOMING HEADLAMPS. The light is focused better by a new-design reflector and lens. It extends the lighted area along the right side and shoulder of the road by as much as 80 feet. A *big* help in driving against oncoming headlamps!

3. GIVE 25% MORE LIGHT. Each beam of the 6-volt headlamp has 5 more watts; filaments are improved. The 25% increase in light shows up parked cars, curves and pedestrians that are out of range of ordinary headlamps.

Make your car safer for night driving with G-E *All-Weather* Headlamps now. Already approved in 44 states. Most garages and service stations have them or will soon.

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6 volt per pair **$3.60** plus nominal installation charge

12 volt **$3.80** per pair

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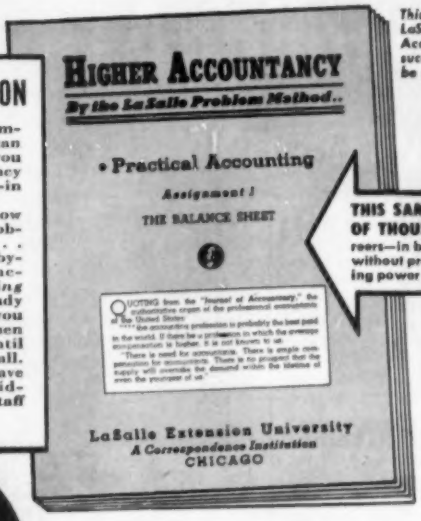

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Then let us send you—without cost or obligation—the same Lesson Number One with which LaSalle has started several hundred thousand men and women toward successful accounting careers. We want you to see for yourself how this remarkable method, originated by LaSalle, makes Accountancy simple, interesting, practical, and certain . . . how it leads you step-by-step to a complete mastery of Accounting—and on up to the coveted degree of Certified Public Accountant if you so aspire.

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If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Surveys show that accountants earn more than those in other major professions.

There are five big fields of opportunity open to Accountancy-trained men and women . . . opportunities that are wide open and highly inviting, offering maximum income and job security in good times or bad. And under LaSalle's "Problem Method" you can start earning while still learning—either in spare-time or full-time employment . . . or in business for yourself with no capital required.

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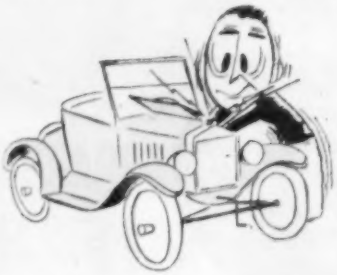
Please enter my drawing in your June contest.
(PLEASE PRINT)

Name _____ Age _____
Address _____
City _____ Zone _____
County _____ State _____
Occupation _____ Phone _____

Letters—

Hot Plugs Can't Scare Gus

In the February "Letters" column [p. 18] Mr. Dodakian seems to doubt that Gus could switch wires on the spark plugs while the engine is running—he'd get a shock. What would Mr. Dodakian think of changing plugs while in flight on a high-compression airplane engine with a scintilla magnet furnishing the shocking current? Lots of mechanics can ground out all four plugs on a four-cylinder engine with their fingers and stop the engine that way. The expression on



the person's face undergoes a slight change during the process, however.

WM. MORROW, Antioch, Tenn.

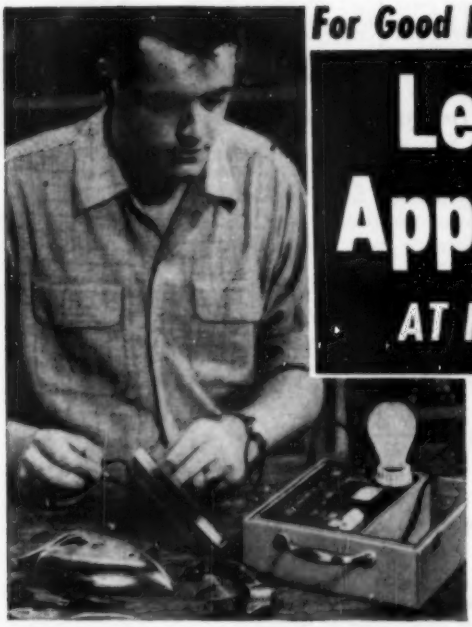
Three Honks for Careless Drivers

The Careful Drivers Club of Denver is sponsoring a campaign to shame traffic violators into safer driving. When a citizen sees a violation, he signals the violator by blowing his horn three times, making the blasts short to keep noise down.

J. M. PHELPS,
President, Careful Drivers Club, Denver

Work on Choke Pays Off

I was only getting 12 miles to the gallon with my car. Then I read your article, "How to Keep an Automatic Choke Automatic" [Jan., p. 193]. Being too lazy to clean all the parts, I just set the choke a few notches leaner and cleaned the air cleaner



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Build a better future. Get into a field where there is important work and the security that comes from knowing a good trade. The electrical appliance repair business offers OPPORTUNITY FOR YOU. Every wired home today has an average of 8 electrical appliances. Up to 10 million new appliances are sold every year. Owners pay well to keep them in repair and enjoy the convenience they provide. That means there's a fast growing need for trained men.

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Start soon to fix electric toasters, clocks, fans, vacuum cleaners, etc. for neighbors and friends. Spare time work done in your basement, garage, or spare room can earn you $3 to $5 an hour. See how easy it is to increase your earning power—how you can pay for this training many times over with spare time earnings.

Opportunities Increasing For Men Who Know This Profitable Trade

You may want to be your own boss so you can enjoy the profits of your business. Or you may want to qualify for the better job of Service Manager or Supervisor in an Appliance Servicenter. Or perhaps you want to supplement your income doing electrical appliance repairs in your spare time. Opportunity in this growing field is great. Send for free book and see what the Electrical Appliance field offers you!

Learn and Earn With This Appliance Tester You Get

This course includes the parts to build this sturdy portable appliance tester that helps you find electrical defects quickly and easily. You use it to learn and do actual electrical and appliance repair jobs. This multi-use tester helps you start making money soon after your training starts.

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and now I get about 27 miles. I can hardly believe it. Let's have more useful information like this.

WILLIAM A. GREINER, Condon, Ore.

Tricking the Tricksters

In many stores in small towns like ours, the owners permit customers to use their telephones for free local calls. But some larcenous people sneak in expensive long-distance calls, then depart without paying the toll.

So a friend of mine simply removed the little tab that holds the phone's number. Now when the long-distance operator asks

her usual "What is your number, please?" the call-maker is stymied.

MRS. STANLEY CLARK, East Bradenton, Fla.

Parts Cleaner Was Patented

Your February issue has a description of a parts cleaner in the department, "Hints from the Model Garage." This piece of equipment is a patented article manufactured by the Gale-Martin Corp., 540 W. 24th St., New York City.

CHARLES WULSTEIN, New York

A Vote for Controversy

I get a bigger kick out of many controversies in your Letters column than I do out of the Sunday funnies. I particularly like to read the heated exchanges on the subject of automobiles.

I see these people every day—the guy with the two tons of horsepower, gadgets and chrome; the guy with the sports car which cost him four thousand skins and which he claims saves him dough on gas; the guy with the motorcycle who maintains that there is no other way to travel, and who rides with me in our car when it rains; and particularly the guy who claims that the way to save dough is to buy a car and keep it eight years, and is always the first in town to be driving the new model each year.

But I particularly admire the guy who

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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never enters the arguments, who doesn't do his darnedest to show his tail lights to every other driver in town, and is kind to his family and his dog.

But don't list me as antiprogressive, please. I have automatic drive, turn signals and a radio in my car, and I like them. Who knows, some day I may develop a taste for air conditioning, windshield washers and even a hydraulic seat which will shuffle me all over the car at the touch of a button.

C. A. Rambow, c/o FPO, San Francisco

Mercury Mining Was Different Then

I read with interest the January article [p. 139] on the "Mysterious Boom in Mercury Mining." In 1918-19 it was far different. I saw flasks of mercury, worth $75 each, stacked like cordwood on a Pennsylvania hillside, for fulminate of mercury. This was used in caps and detonators.

Those stacks were fairly safe. It would have been hard for anyone to get away with a flask under each arm. Loyal countrymen would have spotted a thief or a stranger very quickly.

R. E. Bowman, Blacksburg, Va.

By Any Other Name, It Still Sticks

Having just read your excellent article on installing plastic counter tops [Feb., p. 110], I am writing to compliment you. There is one point, however, that I would like to draw to your attention. You say, "Spread gunk on the panel back and plywood subsurface."

"Gunk" is the trademark for a degreaser

compound. I know that this was not intentional, but it struck me as funny.

Jack S. Southcatt, London, Ont.

Hereafter we'll stick with stickum, goo, glop or goop.

Lighted Level Easy to Make—or Buy

Like the gentleman from Minnesota, I too wanted an illuminated level for working in

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

McMORROW, BERMAN & DAVIDSON

Registered Patent Attorneys

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142-D VICTOR BUILDING, WASHINGTON 1, D. C.

dark corners ["I'd Like to See Them Make," Feb., p. 153]. So I bored a ⅝" hole in my wood level and slipped in a dime-store "pen" flashlight. Cotton wadding wedges it tight.

A. J. WAIGHT, Hornell, N. Y.

We are distributors for just such an item. . . . Our Luma-Level comes complete with light and batteries.

C. E. WOODEND, Arn-Wood Co., Denver

Good Question

Re: "How I Fly the Pogo Plane" [Feb. PSM, p. 122].

I would like to ask one question. How would you make a crash landing? It would be pretty hard to pancake, wouldn't it?

CHARLES N. REINSEL, Clarion, Pa.

If the engine failed, the Pogo pilot would have to bail out rather than try to crash-land.

WHAT SECRET POWER DID THIS MAN POSSESS?

BENJAMIN FRANKLIN (A Rosicrucian)

WHY was this man great? How does anyone—man or woman—achieve greatness? Is it not by mastery of the powers within ourselves?

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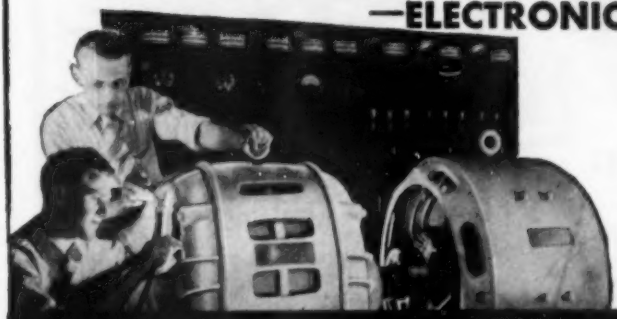

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RECORD CHANGERS
AUTO RADIOS
PUBLIC ADDRESS Systems

(Right—Instructor helping students check the wiring and trace circuits of television receivers.)

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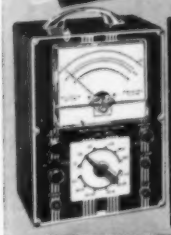

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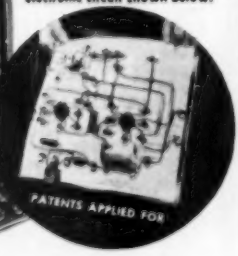

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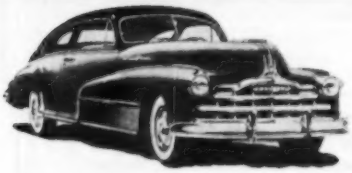

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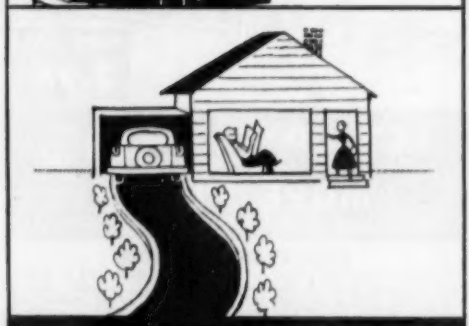

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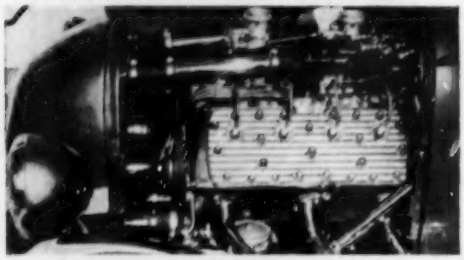

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A clean system • To get good heat transfer the cooling system must be clean. Often the inside surfaces are coated with dirt, grease, rust or mineral scale. Sometimes there's enough sediment and rust to clog up some passages and part of the radiator section. If fan and pump are working right, a dirty system is the most likely cause of engine overheating.

Take out anti-freeze • Anti-freeze, too, increases overheating. In hot weather, it is important to remember that water can transfer more heat than anti-freeze solution does. Result? A combination of anti-freeze and a dirty system will cause enough overheating to cost you as much as 6 points in gasoline octane rating. Put another way, that means the equivalent loss of 1½ gallons of premium gasoline in every tankful.

Stop corrosion damage • Water alone will cause rust and corrosion. In Summer heat, water plus carbon dioxide, exhaust gases and other likely impurities can cause serious corrosion damage. The inhibitors in anti-freeze will protect you for the winter, but they may become exhausted and you can't depend upon them for Summer driving.

Expert advice • The Society of Automotive Engineers recommends, "Where anti-freeze has been used, drain the solution in the Spring; flush the system thoroughly and clean if necessary; then install a fresh filling of Summer rust inhibitor and water."

A message in behalf of your car engine from . . .

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ONLY FILTER THAT DESTROYS ENGINE ACIDS

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FILTERS THE DIRT BUT NOT THE DETERGENTS

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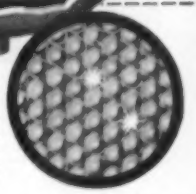

MAGNIFIED PORTION of MICRO BRONZE filter showing microscopic metal balls fused together to make a solid, but porous, filter. MICRO BRONZE metal can't absorb additives, can't "channel," can't "blow," yet screens out finest particles of grit and metal which drop to bottom of filter housing as "sludge."

"FILTERS THE DIRT—BUT NOT THE DETERGENT!"

Major oil companies have developed heavy duty oils containing expensive additives and detergents that greatly reduce engine wear. Conventional-type filter replacement packs—standard equipment on many cars—soak up these beneficial elements, but by-pass damaging abrasives and metal particles into the engine. The MICRO BRONZE exclusive double-cone design *filters out* abrasives and metal particles as microscopic as 39/millionths of an inch (one micron). Oil additives are *left in* to provide a protective film between moving parts. New MICRO BRONZE Oil Filters, combined with modern HD oils, *double your engine's life!*

Burned gasoline creates a strong sulphuric acid solution that eats into vital engine parts, causing them to wear out years before their time. MICRO BRONZE *is the only filter in the world with a built-in acid neutralizer* which adds years to engine life and eliminates the main reason for frequent oil changing.

FITS EVERY CAR AND TRUCK

A MICRO BRONZE Unit that fits any standard filter housing including all full-flow models costs only $6.95. Easy to install, never needs changing. MICRO BRONZE Filter Housing, $9.95.

You'll save the total cost of your MICRO BRONZE Oil Filter in a few weeks. You save in replacement pack costs and "the quart for the pot" you need every time you change filter packs. *Most important, you save costly oil changes—with average driving, one oil change per year is sufficient.*

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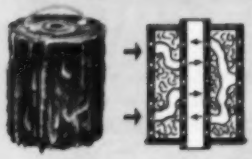
THROW AWAY YOUR OLD FILTER



At left is shown an old-style filter "pack"—the kind that's probably in your car now. How can a dirty pack keep oil clean? It can't—actually contaminates your oil! Illustration at right shows how ordinary packs "channel" as a result of oil pressure, allowing dirt to tunnel through the pack and into the oil.

THIS MAY BE WORTH $10,000 OR MORE TO YOU!

If you would like to be one of the people we are appointing as a MICRO BRONZE Distributor or Dealer, write, wire or phone us today. Exclusive territories with profit potentials of thousands of dollars are now being awarded. Address: Sales Division, MICRO BRONZE Filter Corp., 11766 W. Pico Blvd., Los Angeles 64, California

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MICRO BRONZE Filter Corporation, Dept. PS-55
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Ship me immediately..... MICRO BRONZE Oil Filters with lifetime guarantee as follows. I understand you will promptly refund my money if I'm not pleased.

☐ Conversion unit @ $6.95. Factory pays shipping.

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SIMPLE TO OPERATE!

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With DIP-COTER lower article into solution, dip in anode for 20 seconds — and the plating is done. Both operate on the mild, safe current of two penlite batteries.

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- For CHROME OR NICKEL use Met-L-Cote kits. Plates with a non-corroding metal alloy similar to chrome and nickel.
- Rhodium kits plate with pure rhodium — more precious than platinum — beautiful as silver . . . but doesn't tarnish.
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	Silver	Met-L-Cote	Copper	Gold	Rhodium
Appl-I-Coter Kit for brush-plating large pieces	☐ 3.95	☐ 3.95	☐ 3.95	☐ 6.15	☐ 7.95
Dip-Coter Kit for bath-plating small articles	☐ 3.95	☐ 3.95	☐ 3.95	☐ 6.15	☐ 7.95
Combination Appl-I-Coter and Dip-Coter Kit	☐ 5.95	☐ 5.95	☐ 5.95	☐ 8.95	☐ 12.45
Extra Anodes	☐ .50	☐ .50	☐ .50	☐ 1.25	☐ 3.50
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Combination Kits of all Five Metals, Appl-I-Coter ☐ 19.95 Dip-Coter ☐ 19.95

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650x15	4.34	650x20	7.84	750x20(8)	8.54	1000x20	14.14
700x15	4.64	700x20(8)	8.94	750x20(10)	9.94	1100x20	16.14

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600x16	5.28	700x16	6.78	550x17	5.48	825x20	18.68
600x16(6)	6.58	700x16(6)	7.98	600x20	9.78	900x20	18.98
640x15	5.68	750x16(6)	8.98	650x20	10.88	1000x20	19.98
650x16	5.78	800x15	6.88	700x20	12.88	1000x22	21.98
650x16(6)	6.98	820x15	7.48	32x6(8)	10.48	1100x20	20.98
650x15	5.98	710x15	6.09	32x6(10)	12.48	1100x22	21.98
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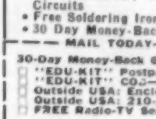

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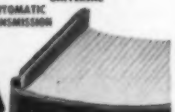

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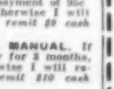

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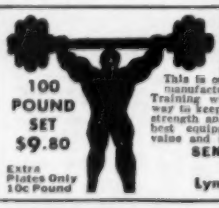

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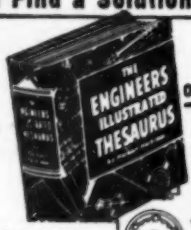

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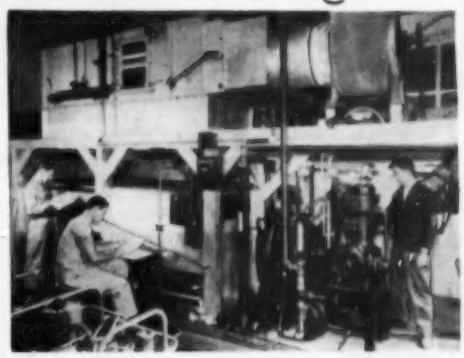

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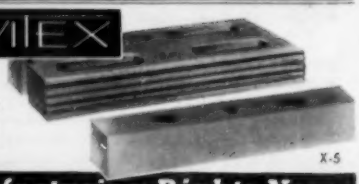

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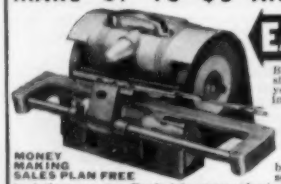

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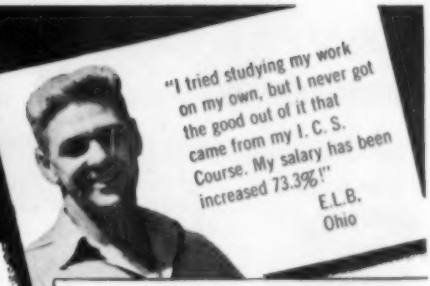

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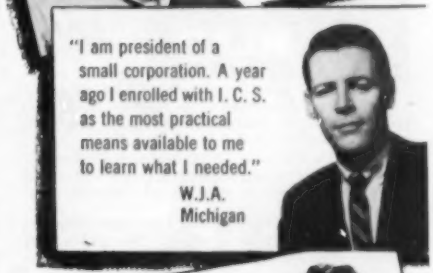

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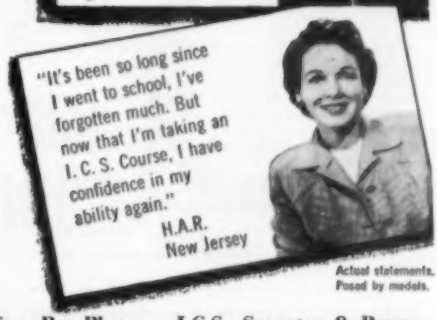

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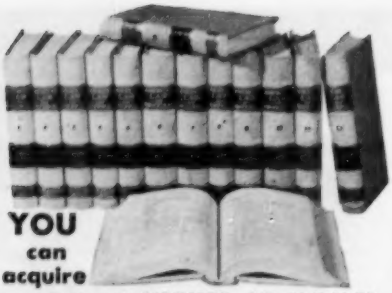

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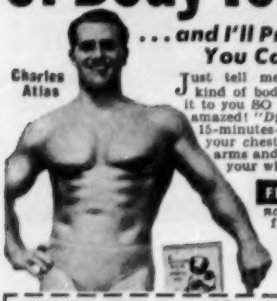

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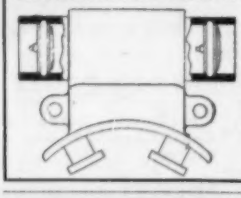

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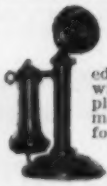

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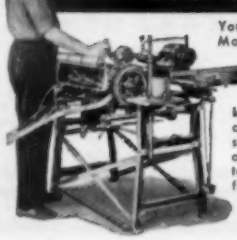

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MEGAPORE MICRO-FILTER

Since mid-1954 LIFE-TIME engineers have been installing this unusual material in all batteries. It is a vast and important improvement over the previous best separator, a plastic-coated fiber sheet. You may be surprised to learn that, even today, the plates in most batteries are separated by thin wooden "shingles" or even heavy paper. These substances are rapidly "digested" by the acid electrolyte and are probably the reason why you have purchased many a battery in your time. Once a separator fails and allows a positive and negative plate to touch, the power from that cell is instantly 100% lost and dead. And once one wooden separator goes the rest are close behind. There you have the real story of why 57% of all batteries are replaced each year. To our knowledge, this has never before appeared in print.

The new Megapore Micro-Filter is so fine that it allows only the ion solution to pass, barring even microscopic solids which build up and short out ordinary batteries. The MM-F contains millions of pores which completely circulate the electrolyte and stop "acid-starvation" of the end plates, a condition of even new premium batteries which may cut amperage and starting power up to 10%!

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The original LIFE-TIME Batteries are now just about reaching their eleventh year. We occasionally hear from present owners that their original model is still putting out the old amps. Here is part of a letter about a more recent experience which a LIFE-TIME Battery went through. Attorney Martin Johnson of Providence, Rhode Island, writes: **"My car was completely submerged at the seashore by the hurricane of August 31, 1954. I am most happy to inform you that within two days following the submersion I saved the battery, flushed out the cells and replaced with old battery acid and then recharged it on the generator of the old car. The battery has, I believe, been completely restored and still has its old zing!"**

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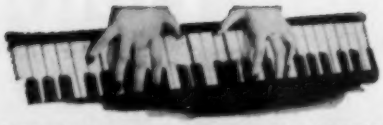

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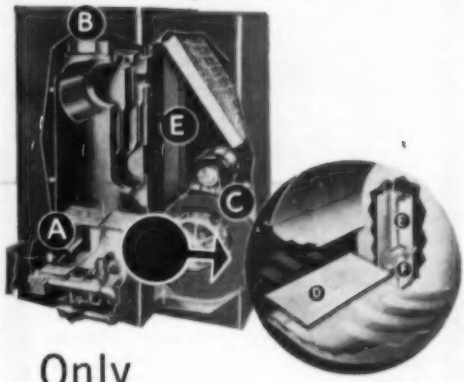

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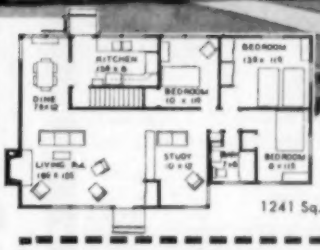

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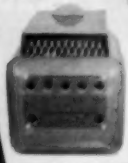

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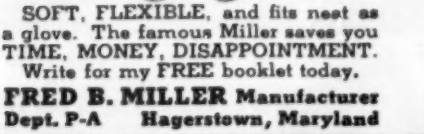

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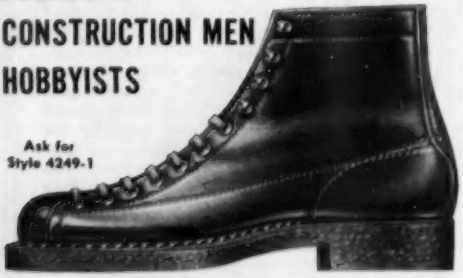

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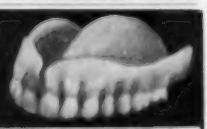

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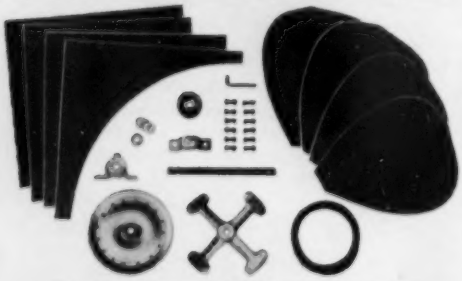

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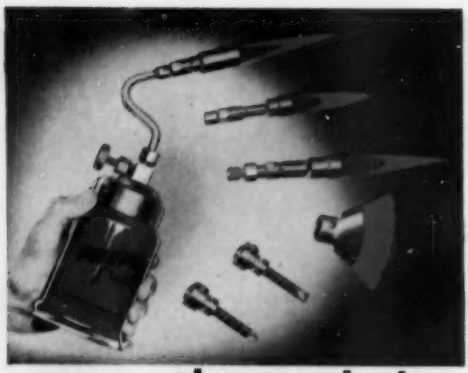

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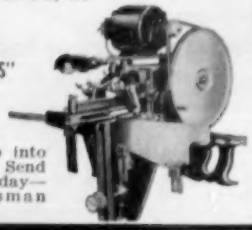

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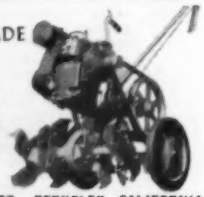

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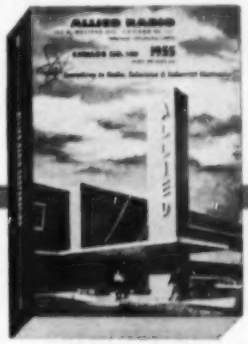

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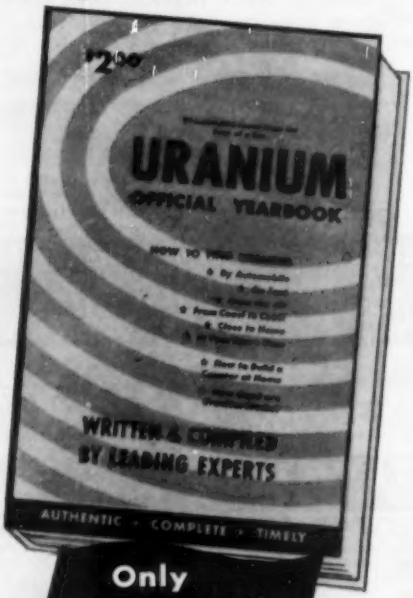

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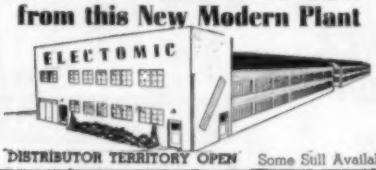

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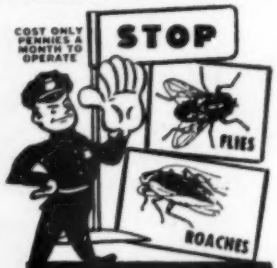

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MAKE Money—Repair tobacco pipes in your own home—A profitable business from a very small investment. For complete particulars write Craft Pipe Repairs, Center Street, East Aurora, New York.

FREE Electroplating information. Money Making Plans. (Formula included). Send postcard for your copy. Highly paid, interesting, uncrowded field. Plater B. Hyde, 327 West 120th Street, Los Angeles 61, California.

OPPORTUNITY Seekers names. 60 days old. All seeking ways to make money at home 1,000 $8.00, typed on gummed labels. Two copies $10.50. Ken-West Distributors, 7-TB South Harlem Street, Worcester 4, Mass.

EARN $25-$40 Weekly mailing circulars for advertisers. Complete instructions—25c. Siwaslian, 4317-B Gleane, Elmhurst 73, N. Y.

UNUSUAL Opportunity. Spinning at home. Supplies, market, furnished. Angora House, PSM, Springfield, Illinois.

FREE. "How to Build Your Own Mail Order Business," with year's membership to Opportunists Mail Club. Receive hundreds of selected money-making propositions, business offerings, 25c year. Money back guarantee. Storm Associates, Cedarville, N. J.

MAKE Durable building plastic, easily. Beautiful, tough—101 uses—exclusive district—Unlimited demand—800% profit. Bays Laboratory, Oklahoma City 9.

ATTENTION Men: Work clothes below wholesale cost. Quality cotton pants 89c; shirts 79c; Coveralls $1.69; shop coats $1.59. All garments reconditioned, sterilized. We will ship anywhere C.O.D. Eastern Processing Co., Box C, Franklin Station, Baltimore 23, Maryland.

$4.20 BUYS Dozen $1.50 guaranteed Fire Extinguishers. Bill Mattox, 263-PS, Duluth, Minnesota.

FAST Selling mailorder item. Three selling plans, circular, sales letters and sample $1.00. Gordon Products, Box 1022A, Syracuse 1, New York.

MAKE Perfumes, other products. Sell mailorder. "Carelabs," 1914 Chouteau—PS55, St. Louis 3, Missouri.

TIN-Cans. Turn them into cash. Nine methods. Instructions 50c. Charles Company 12-EDH, Norwood, Ohio.

EVERYBODY Needs this! Profitable home business. Mailtrader, Box 643, Ann Arbor, Michigan.

EARN Cash! A. R. Dornan, 4 Whitfield Road, Somerville, Massachusetts.

MAKE Money at home as renewal headquarters for all magazines. Big profits now. Liberal commissions. Supplies furnished. Experience unnecessary. Write for Free Catalog. McGregor Magazine Agency, Dept. 510-B, Mount Morris, Illinois.

THIS Is your opportunity. Free details. C&L Sales, 203 Jackson Ave., Johnson City, Tennessee.

MAKE Money on service for hotels, restaurants, clubs. Details 50c. Fairview Industries, 20502 Lorain, Fairview Park 26, Ohio.

STORES. Stock stamp packets for collectors. Percentage basis. No investment. Jaydee, 218 Dickinson Southwest, Grand Rapids 7, Michigan.

MAILORDER Business operated in home. Our method explains advertising, manufacturers, how to begin, what and how to sell. $2.00 Liggett-Petty, 3005 Wayne, Kansas City, Missouri.

WHOLESALE Pricelist—Refrigerators, washers, televisions, Powertools, appliances, 25c. Belmont, 861 Dumont Ave., Brooklyn 7, New York.

$10,000 YEAR Easy! Own your own sales and buying service business without investment or inventory through America's (2) Greatest Wholesale Catalogs! Appliances, homewares, furniture, cameras, sporting goods, toys! Free catalog plans! General Wholesalers, Box 3058PG, San Francisco.

MAKE Money in landscaping—Start your own business, part or full time. Many good paying positions open. Earn while learning. Send for Free Book. National Landscape Institute, Dept. S-55, 310 S. Robertson Blvd., Los Angeles 48.

MAIL Order business—Your own. Write: Ferguson, 324 West Maple Road, Indianapolis 8, Indiana.

EARN Money at home easily, details $1.00. Michelle, 281 Columbia Circle, Ephrata, Washington.

$2.00 HOUR Guaranteed. Your Business. Investment no problem. Details $1.00. Kavenaugh, Box 74731 Oakwood Station, Los Angeles 4, Calif.

FANTASTIC Profits in your own Wholesale Buying Service! Buy 66-2/3% less than retail 10,000 famous Appliances, homewares, jewelry, sporting goods, furniture, toys. Sell others at discounts! Free details! National Buyers Service, Box 426PF, Oakland, California.

STOP! Be your Own Boss. Free Details. Knight's, Box 241, Cactus, Arizona.

PRINT for Profit at home. Amazing new method prints colorful posters, banners, greeting cards, glassware—anything. Hundreds at time. No press needed. No art. Fantastic profits! Need representative your area immediately! Free home-business plan. Screen-Print, Dept. PS-5, Los Angeles 61, California.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as $9.00 you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The July issue closes on May 25. Write today for order blank. O. K. Kelly, Classified Adv. Mgr., Dept. 55, Popular Science Monthly, 353 Fourth Ave., New York 10, N. Y.

37A CLAIM INVESTIGATORS

INVESTIGATE Accidents! Many earn to $10,000 yearly. Claim Investigators needed by airlines, insurance companies, railroads, government offices. Also excellent opportunities for your own business. Allan earned over $2,000.00 in ten weeks without prior experience. Free book. No obligation. Placement counsel and help. Write today! Universal Schools, Dept. B-5, Box 8202, Dallas 5, Texas.

38 MONEYMAKING OPPORTUNITIES

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work Home! Start Sparetime! Deumant Surveys, Kenmore, 23-S, New York.

MAKE money addressing envelopes sparetime. Glenway, 5713 Euclid, Cleveland 3, Ohio.

SELL-buy Titania Gems. More brilliant than diamonds. $9.75 carat wholesale. Free Catalogue. Diamonite, 1404-S Mitchell, Oakland 1, California.

START A Buying Service, buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers', 630-T Linden, Buffalo, N. Y.

EARN Ready Cash doing mailing work—No experience needed—Y. Wilson Business Service, 2875 Glendale Blvd., Los Angeles 39, California.

MAKE $10,000 Year and more with our (2) Great Wholesale Catalogs (64 and 300 pages)! Appliances, homewares, jewelry, furniture, sporting goods, toys! Free Catalog Plans! General Wholesalers, Box 3058FH, San Francisco.

PROFIT! Prestige! Publish a magazine under your own name! Only $3. per month! Sample, details 5c! Filmer, 910 Marion, Pharr 17, Texas.

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write. Wagoner, P-125 West 86th, New York 24.

MAN Wanted—Are you dissatisfied with your work? Would you like a business of your own? If so, write Rawleigh's, Dept. E-GG-PSC, Freeport, Illinois.

MAKE extra money. Address, mail postcards. Spare time every week. Write Box 14, Belmont, Mass.

EARN Money at home! Must have good handwriting. Write for details. Atlas, Box 188-P, Melrose, Mass.

NEW 7"x11" Ultra-Blue Signs, 7c, retail 50c. Sample free! Lowy, 812 Broadway, Dept. 864, New York 3.

SPARETIME Profits Taking Subscriptions. All Magazines. Wholesale Catalog Free. Cassell Publishers, Westfield, N. J.

FREE Course in locksmithing, picking, etc. W. Thompson, Box 738, Saratoga, Calif.

ADDRESS envelopes at home. $25 weekly possible, sparetime. No selling. Temple Co., Box 946 Muncie 7, Indiana.

FREE Folio "Up to $45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Work home—sparetime! Haylings—816, Carlsbad, Calif.

$35 WEEKLY addressing envelopes. Instructions $1, refundable. Adservice, Spring Valley 36, New York.

WANT to go in business for yourself without capital? We show you how. Postcard brings all details free. Topval, Lindenhurst 222, New York.

MAKE Money growing miniature trees on your window sill. Free seed and plan. National Nursery, Dept. GC, Inglewood 4, Calif.

FREE! Complete Mailorder Business! Terrific Profits! No Investment! VitaMins, 2908-P8X Beverly Boulevard, Los Angeles 57.

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FRANCHISE County agents wanted for copyrighted mailorder information service. You secure orders, we fill them. Sample mailing pieces, details, $1.00. L. C. Hannon, P.O. Box 4891, Kansas City, Mo.

PRINTING And office supplies wholesale. 20,000 items. Literature free. Royal, Box 368-S, Cleveland 27, Ohio.

DIAMONDS In Venezuela's rivers are making determined men wealthy. Have you the courage to seek your fortune in America's last frontier? Illustrated booklet, "Prospecting in Venezuela." Supplies only complete information. $1.00 cash or money order. A.M. Information Survey, Box 5091, Cristobal, Canal Zone.

HOME Business opportunity! Mailing literature featuring books, merchandise. Everything supplied. National, Box 88, Dorchester 22B, Massachusetts.

MONEYMAKER — Surefire — Complete plans 50c. Glover, 503 Newkirk, Trenton, N. J.

ADDRESS Envelopes at home $50.00 weekly possible. National Industries, 33 Hyde Park Ave., Jamaica Plain 30, Mass.

SAVE $50.00-$100.00. Make your garage as modern as your home. Open and close your garage door right from your car with an amazing Door-O-Matic electric garage door operator. New 1955 models for as little as $129.50. Attaches to any overhead door, pre-assembled at factory for easy installation, complete with full size motor. Write for details. Door-O-Matic Co., Dept. 60, Russia, Ohio.

GOLD, Silver—How to Refine, Test, make solders, alloys, etc. Book $4.25. Money-back guarantee. Herman, Publisher, 937-P West 12th, Los Angeles 15, Calif.

BUY, Sell and swap for profit. Amazing new method. Inquire, Box 621H, Culver City, Calif.

SELL Merchandise by mail. Everything supplied. Big profits. Details 10c. Stull's Buying Service, 621 Adams Ave., Scranton, Pa.

THOUSANDS Items wholesale catalog $1, refunded first order. Opportunity, Box 1428, Basking Ridge, N. J.

MONEY in sparetime Fixit Shop at home. Repeat cash business. Experience unnecessary. No selling. Free booklet explains. C. Foley Company, Columbia Heights, Minnesota.

ACME Saw sharpeners are the finest you can own. Don't be satisfied with less. Send for free literature. Max Mfg. Co., 138 Stockton Ave., San Jose 26, California.

GROW . . . Earthworms, sell-breeding stock, . . soil culture, fishbait, home business opportunity. Write, "Earthworms", Corona, California.

SEND A dollar for informative report "How to Find Uranium." Raymond Jensen, 28 Grant Ave., Fords, New Jersey.

LEARN Technical metaphysics and insure your future. Easy, inexpensive correspondence course. Simplest method known. Diploma. Write: Premier College of Technical Metaphysics, 2532 McKenzie St., Vancouver, B.C., Canada.

HUSBAND-Wife successful in mail order business. Details free. Chas. S. Edwards, 5100A East Side Avenue, Dallas 14, Texas.

MAKE to $4.50 hour doing common pen lettering. National Artists, 801½-C North Marsalis, Dallas 3, Texas.

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EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 2, Wisconsin.

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TYPISTS! Make money at home. Mailers, 2 Madison, Greencastle, Indiana.

WIN contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay $3.50 lb. We paid Babbitt $4,165.00 in few weeks. Free Book. Washington Mushroom Ind., Dept. 179, 2954 Admiral Way, Seattle Washington.

$200. MONTHLY possible raising earthworms! Backyard, garage, basement. Complete illustrated booklet explains raising, feeding, packing, marketing. 25c postpaid! Ozark Worm Farm-V, Willow Springs, Mo.

GIANT Mails — Moneymaking Offers. Send 25c Today! Wrede's, Atkinson, N. C.

EXCEPTIONALLY Profitable Home Mailorder Business Plans. Lewis Bartlett, Richland, Georgia.

FREE Book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-35C, Oceanside, Calif.

MAILORDER Business spare time. Book, "Doing Business by Mail" every business scheme fully explained, $1.00. Ken-West Distributors, 7-TB South Harlem Street, Worcester 4, Mass.

SHARPEN Scissors—Profitable—Full details—$1.00. Box 85, Bronx Central P.O., N. Y. 51.

WE Pay cash for home work. No selling. Wilco, Box 8032, Nashville 7, Tenn.

EXTRA Money addressing mailing postcards. Gul, 2419 Thomas, Chicago 22, Ill.

PROFITABLE Moneymaking guide, 25c. John C. Chester, 20-A Cromwell Place, Sea Cliff, New York.

SECRETS—Shortcuts, for "Profitable Selling" revealed in new manuscript. Details free. Barnes, 308 Westland N., Massillon, Ohio.

121 METHODS, Home moneymaking without capital. Completely new. Rush $1.00. Brockway, 1145 High, Topeka 1, Kansas.

MAKE Money; address; mail new self-selling catalog; big profits; 25c for sample complete details. Ken-West Distributors, 7-T South Harlem Street, Worcester 4, Mass.

MANUFACTURE Rhinestone and Pearl Jewelry at home. Latest creations, tremendous profits, no skill needed. Postcard brings illustrated catalog of settings, stones, etc. A. V. Cutt Co., Inc., 210-H Fifth Ave., New York 18, New York.

SELL Everybody—A new glue. Holds anything, anywhere, any weather. Instantly. Unbelievable. Demonstration 5 seconds. $4—$1.00 jars, $12.00. Sample $1.00. Postage Free. Best By Test Model Co., Ridgefield Park 20, New Jersey.

CONDENSED Booklet mail-order, export-import. Vinson Supply Co., Box 23, Roosevelt Station, Dayton, Ohio.

MAKE Waterproof paint for basements, masonry walls, swimming pools with Waterboss. One quart makes five gallons. $2.00 postpaid. Agents wanted. Waterboss, Herndon, Virginia.

"7 PLANS For making money at home!" $1.00. Ray Cunningham, Reddick, Florida.

MINIATURES. Sell on sight. Assemble our kits. Details 10c. Hill, 7224A Favor, Oakland, California.

CELERY. Sold $43 from ½ rod common soil. Following year raised 10,000 bunches on 1/10 acre. My copyright system $1.00. E. M. Hooley, 1492 West Eighth Ave., Albany, Oregon.

WHOLESALE Nationally advertised merchandise catalogue, $1.00. Donald Kabel, 870 Lafayette, Buffalo, New York.

$13.50 PER Thousand for home addressing. No selling. Details for stamp. H. M. Service, Box 37215-PS, Los Angeles 37.

BUY Wholesale! Save 66-2/3%! Everything for Home, garden, auto, sports. Free Catalog! Wholesalers Mart, Box 6125FB, Houston, Texas.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as $9.00 you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The July issue closes on May 25. Write today for order blank. O. K. Kelly, Classified Adv. Mgr., Dept. 55, Popular Science Monthly, 353 Fourth Ave., New York 10, N. Y.

39 FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 13, Ill.

COMMERCIAL Formulas—catalog 10c. George, Chemist, 5150 Wilton Pl., Los Angeles 62, Calif.

FREE Formula list—anything analyzed. Northwestern Laboratories, 2316 Brown, Evanston, Illinois.

LIFETIME Business! Manufacture extremely profitable products! Lists free! Thermowks, Peoria 4, Illinois.

"FILM-Etch" Fascinating color process —Hobby or business—Directions $1.00. Box 406, Quincy 69, Mass.

FREE Formula Catalog. Anything analyzed $35.00. Western Chemical, Salem, Ore.

ANY Formula $5.00. Satisfaction guaranteed. Jack, Consulting Chemist, 5138 Gainor, Philadelphia 31.

MODERN formulas for today's fastest selling big-profit products. Literature free! Miller, Chemist, 1517-A, Tampa, Florida.

40 PLASTICS

PLASTICS home-craft course for Men and Women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for Free booklet. Interstate Training Service, Dept. D-2-E, Portland 13, Oregon.

PLEXIGLAS, Lucite sq. ft. (12"x12") cost 1/16" $1.14, ⅛" $1.50, 3/16" $1.85, ¼" $2.20. Add 19% for postage. Almac Plastics, 600 Broadway, New York 12, N. Y.

NEW Liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for "How to Cast with Liquid Plastic" and proved Success Plan showing how to make money at home. Castolite, Dept. E-102, Woodstock, Illinois.

VINYLITE. Price list sent free. Solomson, 46A Cornhill, Boston 8, Mass.

PLEXIGLAS Any size clear sheets ⅛" $1.10 square foot. Ultra Plastics Mfg., Pitman 18, N.J.

PLASTIC Sheets, rods, tubes, plexiglas, vinyl, acetate, nylon, teflon, fiberglas, from America's largest plastic warehouse. Send for Free List. Cadillac Plastic Co., 2111 Olive, St. Louis 3, Mo.

PLEXIGLAS sheets—cut to size—clear, all thicknesses—standard outdoor translucent colors. McClarin Plastics, P.O. Box 168B, Hanover, Pa.

PLEXIGLAS, Fiberglas, Polyester, Acetate, Vinylite. Fast service. Wholesale-retail. Catalog—15c. Gem-O'-Lite, Box 6862P, North Hollywood, California.

NEW, Inexpensive molding press; beautiful samples 50c, refundable. Paragon, Lewiston, Ohio.

FIBERGLAS-Resins for boats in our catalogue. Vanhorn Plastics, 1905 Ingersoll, Des Moines, Iowa.

UNBELIEVABLE — Complete plastic laminating kit—$2.00—Klein, 1804 Harrison, New York 53.

PLEXIGLAS, Lucite. Square foot cost 1/16"—$1.10, 1/8"—$1.45, 3/16"—$1.75, 1/4"—$2.15, 3/8"—$3.28, 1/2"—$4.38. Colors add 10%. Send 15% for postage. Aristocrat Plastics, Inc., 55 Clarkson St., New York City.

41 CHEMISTRY & PHYSICS

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biologicals, and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124B West 23rd St., New York, N.Y.

GEIGER And Scintillation Counters. $29.95 up. Catalog 10c. Atomic Laboratories, Box 343, Berkeley, California.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS and apparatus for industrial, analytical and private laboratories. Catalog 25c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N.Y.

"FUTURE Chemists of America" teaches chemistry for beginners. All ages. Systematic. Exciting. Practical. First lesson 25c. Parkway Laboratory, R #1, McKees Rocks, Penna.

NEW Catalog, lists, 25c. Laboratory Sales, Box 161-B, Brighton, Mass.

AMAZING New Book of Science, Experiments, Formulas and catalogue of Laboratory Supplies. Only 25c. National Scientific Co., Dept. PS-5, 2204 W. North Ave., Chicago 47, Illinois.

42 HELP WANTED

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OVERSEAS, Latin American, Alaska, Canada. Employment. Originator 1955 "Foreign Service Directory" Up-To-Minute Report on Military & Civilian Construction; Oil Companies; Aviation; Transportation; Steamship; Mining; Government Job Info. How-When-Where to apply. Listing Firms Hiring. $1.00. Global Reports, Box 883-S, Hollywood 28, Calif.

FOREIGN Employment Construction Work. If interested in foreign projects with high pay, write Foreign Service Bureau, (Dept. P.S.), Metuchen, New Jersey.

CALIFORNIA jobs. San Francisco classified airmailed $1.00. Hubbard, Box 1442, Palo Alto, Calif.

ADDRESSING Typing Materials furnished rush 25c. Hustlers Club, Alger, Mich.

FOREIGN U.S. jobs to $18,000. Many overseas countries, fare paid. Skilled-unskilled trades, office. Stamped self-addressed env. brings reply. Job Opportunities, Waseca, 2C, Minn.

JOBS To $1,500 monthly. All trades. So. America, Europe, USA. Application forms. Fare paid. No employment fees. For quick reply Write Dept. 76D. National Employment Information, 1020 Broad, Newark, N.J.

ALASKA! $1.00 brings accurate information on employment, homesteading, vacationing, mineral and oil development. Arctic Alaskan Enterprises, Dept. H, Box 3656, Anchorage, Alaska.

WANTED: Adventurous young men to accept supervisory positions in fabulous South America—Land of the future. $12,000 to $32,000 per annum. Tax Free. Men who excell in constructive trades should not pass up this opportunity. Needed are, drivers, operators, electricians, mechanics, carpenters, concrete hands, etc. Over 40% have qualified. $2.00 brings immediate service. Pan-American Constructers' Assn., Box 481, Baltimore 3, Md.

NEW Orleans, Baton Rouge, Louisiana, help wanted columns airmailed $1.00. A. Caroway, 1815 Perkins Rd., Baton Rouge 6, La.

INDIANAPOLIS—Help Wanted and business opportunities column airmailed $1.00. Box 7242, Indianapolis, Ind.

FLINT, Michigan, prosperous city, help wanted and business opportunities column $1.00. Grades, Box 1044, Flint, Michigan.

NOW Hiring 12,500 men for overseas and Alaska! Construction $830-$1053 monthly; factory $760; Office $650. Overtime, free transportation. Catalog, $1.00. Jobservice D-1, Box 30, Billings, Montana.

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INVESTIGATE Booming Foreign and U.S. Construction, Aviation, Oil Opportunities, for Trades—Truck Drivers—Laborers — Engineers — Supervisors — Many Others. Who to contact for highest paying jobs. To $1500.00 Monthly. Latest Copyrighted Reports covering over 52 Countries, including U.S., St. Lawrence Project, Spain, Far North, Alaska, South America, Europe, Canada, etc. Year exclusive registration and advisory service. Application forms. Unconditional Money-Back Guarantee of Satisfaction. Immediate Service. $2.00. Airmailed $2.25. (COD's Accepted). International Reporter, Box 1047-SO, St. Louis 1, Mo.

DENVER Help and business wanted columns. Air-Mailed $1.00. P. O. Box 186, Penrose, Colorado.

OVERSEAS And U.S. jobs. Men, women. Skilled unskilled. High pay. Postcard brings details. Eastland, Box 1406-B, Los Angeles 28, California.

PHILA'S Largest help wanted columns $1.00 also remails 25c. Flaville, 336 Devereaux, Phila. 11, Penna.

EXTRA Money addressing mailing postcards. Gul, 2419 Thomas, Chicago 22, Ill.

LOOK Los Angeles Jobs Airmailed $1.00. Johnson, P.O. Box 22, Los Angeles 53, California.

LOS Angeles Help Wanted and Home Rental columns Airmailed $1.00. Shield, 5745 Second, Long Beach, California.

MILWAUKEE Help Wanted columns airmailed $1.00. Semrad, 1579A S. 16 St., Milwaukee 4, Wisconsin.

$1300.00 MONTHLY for truck drivers. $1400.00 monthly for carpenters, electricians, plumbers, mechanics, $1200.00 for clerks and laborers. Full information and complete foreign listings, with current information on Spain, Korea, Australia, Alaska & Canada, $1.00. Current information on stateside projects, $1.00. Dept. 4-E, Ooportunities Unlimited, 1110 Commerce Bldg., St. Paul, Minnesota.

HIGH-Paying jobs for men and women all over the world! Clerical or Trades. Send $1.00 for satisfaction-guaranteed Job-listings to: Global Enterprises, 1551 Broadway, New York City.

LOS Angeles help wanted ads airmailed $1.00. Letters remailed 25c. Box 104, South Pasadena, California.

GRAND Rapids help wanted columns airmailed. Elster, 213 Pleasant SE, Grand Rapids, Mich.

1000 JOBS In California. All types available. Information about Salary, names of Companies, new industries. Highest pay in U.S. Send $1.00 to Personnel Consultants, 736 Suite 8L Alcatraz Avenue, Oakland, California.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as $9.00 you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The July issue closes on May 25. Write today for order blank. O. K. Kelly, Classified Adv. Mgr., Dept. 55, Popular Science Monthly, 353 Fourth Ave., New York 10, N. Y.

43 AGENTS WANTED

BUY Wholesale—25,000 items—Catalog 25c. Matthews, 1472-A8 Broadway, New York City 36

AGENTS—300% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-E North Clark, Chicago.

BUY Wholesale thousands nationally advertised products at big discounts. Free "Wholesale Plan." American Buyers', 629-T Linden, Buffalo, New York.

FREE Booklet "$5,000—$45,000: Unlimited Vacations." Work home—sparetime. No merchandise, equipment! 100 other home-work businesses! Haylings—PA5, Carlsbad, California.

YOUR own business—Suits $1.50; Overcoats 65c; Mackinaws 35c; Shoes 12½c; Ladies' Coats 30c; Dresses 15c. Enormous profits. Catalog Free. Moro, 1218-J South Jefferson, Chicago 7.

60% PROFIT On Cosmetics—Famous nationally advertised Hollywood Cosmetics pay 60%! Make $25 day up! Hire others. For free samples, details, write Studio Girl, Glendale, Calif. Dept. PS-55.

EARN $30.00 daily with "Dab-It," sensational spot-remover stick. Like magic! Buyers everywhere! Big sales, profits. Free details. M&M, Dept. S-1, 842 Third Ave., N.Y.C. 22.

GOLD or Silver letters, numbers. Windows, Doors, Trucks. 1" to 6". 500% Profits—Free Samples. Atlas-U, 544 West 79th, Chicago 20.

START Your Own Business On Credit. Your own boss. 1135 of our Dealers sold $5,000 to $30,000 in 1954. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. E-U-PSC, Freeport, Illinois.

ABSOLUTELY Free—Sales Kit. Increase your income. Send postcard today requesting kit showing new line, belt buckles with your name or personal initials, cap badges, tie clasps, choice 3000 different emb.ems. Hook-Fast, Box 1425PS, Providence, R.I.

MAKE extra money. Address, mail postcards. Spare time every week. Write Box 14, Belmont, Mass.

GET New Shirt Outfit Free; make $90.00 weekly on 5 average orders a day. Famous quality Made-To-Measure dress and sport shirts at $3.95 up sell fast to all men. No experience needed. Full or part time. Write: Packard Shirt Co., Dept. 895, Terre Haute, Indiana.

30,000,000 WOMEN want amazing new Automatic Refrigerator Defroster. You sell 8 out of 10 on sure-fire Free Trial. $250.00 weekly profit not uncommon. Rush postcard for guaranteed plan. D-Frost-O-Matic, Dept. H-103, 173 W. Madison St., Chicago 2, Illinois.

INCREASE your income—Personal initialed buckles, belts, cap badges. Free information—Hook-Fast, Box 480 (PS), Roanoke, Va.

BIG Money making opportunity. Exclusive line work uniforms, Jackets, pants, shirts, coveralls. Advertising embroidered. Every business prospect. Outfit Free. Master Div., 331 Water, Ligonier, Indiana.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 850 N. Dearborn, Dept. 18, Chicago, Illinois.

HAVE Your own business, buy wholesale, make big profits. Free General Mdse. Catalog. Jay Norris, Dept. PS, 445 Broome St., New York.

MAKE Money giving away free hosiery! Introduce amazing nylon stockings (guaranteed against runs and snags) and men's—children's hosiery (guaranteed one year) by giving away free trial pairs regardless whether or not final purchase is made! Earn up to $3 hour spare time. Mail postcard today for free samples men's and women's hosiery with complete money-making outfits. Nothing to pay now or later. Absolutely no obligation. Kendex, Babylon 54, N. Y.

GOOD Man Can make $3,000.00 next 90 days. Every house in town wants amazing NiLite glowing curbside house numbers. Automatic selling plan pays profits everyday. Write today for details. Free. NiLite, 173 W. Madison, Dept. H-81, Chicago.

BEAUTIFUL Feather Pictures. 200% Profit! Free sample. Apartado 9036, Mexico 1, D. F.

AGENTS—Salesmen: Sell beautiful hand colored plastic enlargements and sensational new personalized photo compacts, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline—better full time. Free sample outfit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

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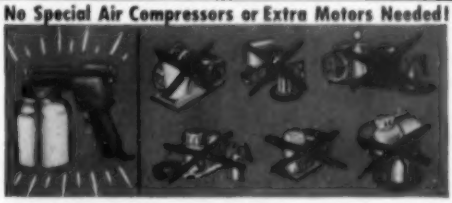

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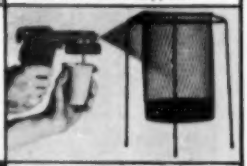

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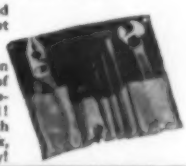

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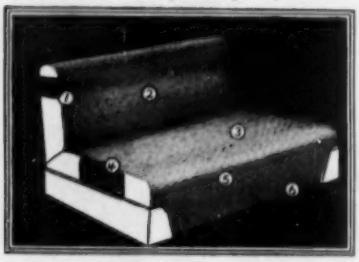

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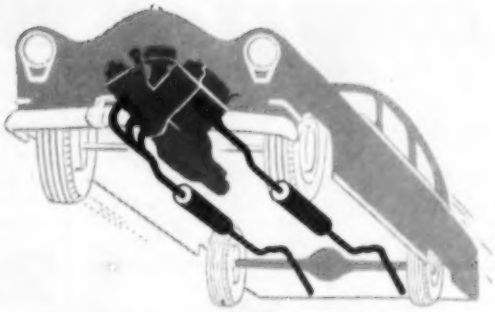

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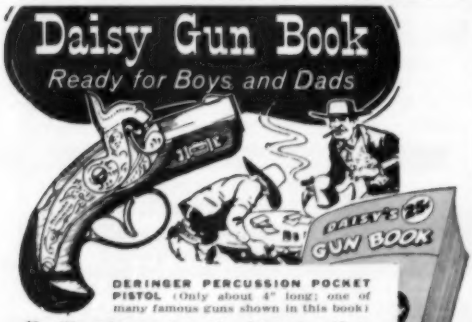

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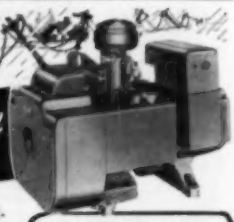

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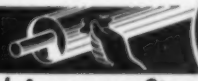

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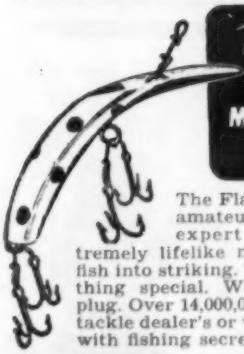

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Your Present Engine Can Last Years Longer ... Thanks to New Sintered Metal Filter Method!

THIS IS THE SECRET that wouldn't keep—the invention that may put men on the moon years before experts believed it could be done. This is the discovery that can make present-day automobile engines last hundreds of thousands of miles—and save millions of dollars for average car owners by reducing operating expenses. Yet, like many great discoveries, it is based on simple principles.

Friction, as every schoolboy knows, is what makes engines wear out. In early steam engines, this was such a minor problem that tallow was good enough for lubrication. Even in the first gasoline engines, almost any kind of oil could do the job.

But as engine heat increased and piston speeds approached 3000 feet per minute, lubrication engineers had to develop new oils containing "additives" you hear so much about.

Oil companies claim these additives are worth the extra 15c to 25c a quart you're paying for oil—and they're right. Purpose of these additives is to keep carbon and gum in harmless suspension in your oil—prevent deposits from forming in your engine. That's why your oil should look dark after a few miles of driving.

But here's the catch: ordinary filter packs made of absorbent material take out these valuable additives. The more often you change filter packs, the more additives you take out. Your oil looks "cleaner"—but you have more carbon, gum and additives forming in your engine.

Shocking? Yes, but that's only part of the story. Oil companies have developed still other additives—such as barium and molybdenum—which may make an engine overhaul something you don't even start thinking about

a four page report on the most important lubrication discovery in a lifetime!

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until 250,00 miles or so. But there was no point in putting these oils on the market until an oil filter could be developed that would not remove additives. True, a few of these additives are already on the market in limited quantities—but, again, they are ineffective as long as they are being soaked up in absorbent filters.

Another problem with ordinary filter packs is what engineers call "channeling." This happens when hot oil, under pressure, forces holes in the paper or rag the pack is made of. As these channels grow larger, more and larger abrasive particles get through into the oil stream where they can score and damage rings, bearings and other precision parts.

To solve these problems, engineers had to find a filter that wouldn't soak up valuable additives, but would remove the microscopic abrasives that do the real damage to precision engine parts. These "danger zone" particles range from 10 to 30 microns in size (a micron is 39 millionths of an inch)—so small that several hundred of them would simply rattle around inside the period at the end of this sentence.

Since conventional absorbent filter material couldn't be packed tight enough to stop these tiny particles without reducing oil flow engineers decided an entirely new kind of filter material had to be developed. Obviously, it had to be metal—but there was no way of making a metal screen fine enough.

Finally, metallurgists found the answer by fusing together millions of tiny metal balls into a porous filter. Being non-absorbent, it wouldn't remove additives, yet abrasives simply couldn't get through the spaces between the tiny metal balls. Made of an alloy that just doesn't wear out, it *never has to be replaced!*

Original Life-Time Filter Passes 300,000-Mile Test

Samples were rushed to government proving centers for testing. Results: the Life-Time metal alloy filter not only solved the critical problem of filtering liquid oxygen, nitrogen, etc., for guided missiles, but could save the government millions of dollars now spent on filter replacement packs for trucks, jeeps, tanks, etc.

Besides government tests, millions of miles of road tests in truck, taxi and car rental fleets reveal amazing results. Cars equipped with the Life-Time filter have already passed the 300,000-mile mark *without ever changing oil filters!*

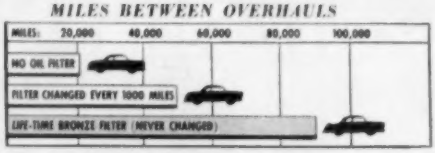
What About Other Metal Filters? Are They Any Good?

In the last few months, a number of Life-Time "type" porous metal filters have suddenly appeared on the market. Some of them look like the original Life-Time filter; others are experimental designs and "improved" substitutes. Until these can be tested, no one can say whether they are any good or not.

So far, only the *original, genuine Life-Time* filter has passed the 100-G shock test, ultra-sonic vibration tests and met military performance requirements. And the original Life-Time filter is available only from the Continental Manufacturing Corporation and its authorized dealers. You can't get it anywhere else.

How *LIFE*-TIME 2-Way Acid Protection Increases Engine Life

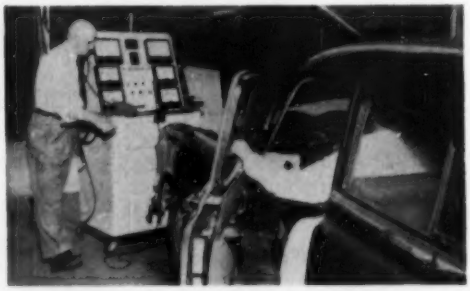
MILES BETWEEN OVERHAULS



Every mile you drive, a certain amount of water gets into your oil. The heat of your engine makes this water combine with sulfur in your oil to make sulphuric acid. This acid eats bearings and other precision parts, causing costly damage.

The Life-Time metal oil filter actually removes water from your oil. Laboratory tests prove it does this.

In addition, the Life-Time oil filter has a special magnesium insert which neutralizes acids that



250,000 MILES before a major overhaul should be normal with today's engines and oils. Only the Life-time filter meets modern requirements.

DIESEL AND GASOLINE truck fleets have proved value of Life-Time porous metal alloy oil filter in hundreds of thousands of miles of road tests.

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have already formed in your engine. Laboratory tests prove it does this.
Road tests (see graph) prove that engine life is greatly increased by the Life-Time filter because it removes all dangerous abrasives, removes acid-producing water and makes acid already in your oil harmless.
Only the original, genuine Life-Time metal alloy filter proves its claims of increased engine life by both laboratory and road tests.

Life-time Oil Filter Never Wears Out—eliminates filter pack replacement forever!

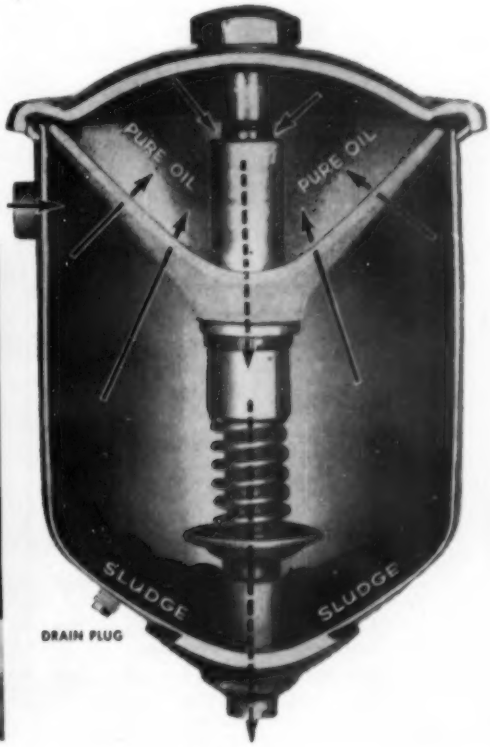
You never change the Life-time filter—just rinse it occasionally in gasoline and it's good as new. In addition, you save the quart of oil soaked up and thrown away regularly with ordinary replacement filter packs, which can add up to a lot of oil during the life of this filter. How long is that? Well, the Life-time filter is guaranteed for 10 years.

But since the metal alloy never wears out, the money you save on the filter packs you don't have to buy, plus what you save in engine overhauls, is something for your life insurance man to figure out for you.

To find out how you can have a permanent metal Life-Time filter on your car, see next page.

How The LIFE-TIME Filter Works

As dirty oil is forced through element, all harmful particles drop to bottom of filter case. Only pure, filtered oil can get back into circulation.



"SMOKE TEST" proves superiority of Life-Time porous metal filter. Ordinary filters cause oil pressure to drop when fibers soak up oil, expand and prevent free circulation.

How to Get a Life-Time Filter for 2 Weeks Trial in Your Car or Truck

You can try a Life-Time filter in your car for two weeks to see if it's really all we say it is (it is, and more). If, however, you decide you don't want to keep it because you miss the fun of buying filter packs, or for any reason, all you do is send it back for a refund, with no questions asked. Ordering is simple:

1. If your car already has an oil filter, you can convert it to a Life-Time filter with a kit which replaces your throwaway pack with permanent metal. Just send us the make and number of your present filter pack (if you know it); otherwise, send us the make, model and year of your car or truck. Enclose $6.95 (we pay shipping) or send $2.00 deposit (you pay balance and C.O.D. charges on arrival).

2. If your car has no filter now, or you want to replace the one you have, send us the make and model of your car and $12.95 (we pay shipping) or $5 deposit, balance C.O.D.

3. Specially-designed conversion kits for cars with full flow systems and for Buicks with hydraulic valve lifters, $13.95 (we pay shipping). Or enclose $2 and pay balance and C.O.D. charges on arrival.

EASY TO INSTALL

If your car already has an oil filter, you can install a Life-Time permanent metal alloy element as easily as changing throwaway filter packs. If your car has no filter now, you can install a complete Life-Time unit fairly easily; no special tools are needed.

See your authorized Life-Time dealer or order direct from the manufacturer. Do it today—before you waste another cent on filter pack replacements.

Permanent Filter Division, Dept. CPS-5
Continental Manufacturing Corp.
Washington Blvd. at Motor Ave.,
Culver City, California

Rush Life-Time filter for:

Make, model, year of car _____

_____
Present filter make and model (if known)

I enclose

☐ $6.95 for conversion kit (full flow, $13.95); factory pays shipping.

☐ $2.00 deposit for conversion kit; send C.O.D.

☐ $12.95 for complete unit ($18.95 for chrome); factory pays shipping.

☐ $5.00 deposit for complete unit; send C.O.D.

Name _____

Address _____

City _____ Zone _____ State _____

1. Conversion Kit

replaces present filter element with Life-Time metal alloy.

2. Complete Unit

...which replaces entire old filter, is easily installed.

WHY NOT MAKE JUST ONE SIZE?

Actually, it is fairly easy to make a metal oil filter that can be installed on any make or model of car. Trouble is, different cars have different oil capacities, oil pressures, etc. A "universal" model oil filter that did a halfway job in all cars and a good job in none would be a waste of money, no matter how cheap it was.

That's why special models of the Life-Time filter were designed for every car, truck, agricultural vehicle, etc. It cost a great deal of money and took many years to engineer and test these special porous metal filters. *Only the original, genuine Life-Time oil filter has a model engineered especially for your car.*

This saves the car owner the expense and nuisance of returning "universal" filters that don't do the job. It builds good will for dealers who handle the original, genuine Life-Time filter.

See your authorized Life-Time dealer or order direct from the manufacturer. Do it today—before you waste another cent on filter pack replacements!

Opportunities Now for Life-Time Filter Dealers and Distributors

A dealer and distributor network is now being formed to handle demand generated by 4-page reports like this published in leading national magazines, plus sponsorship of radio and television broadcasts of the Indianapolis 500 and the Panamerican Road Race.

For complete information on how you can be first with the most exciting automotive product of this decade, write or wire:

Continental Manufacturing Corporation
Dept. CPS-5, Washington Blvd. & Motor Ave.
Culver City, California

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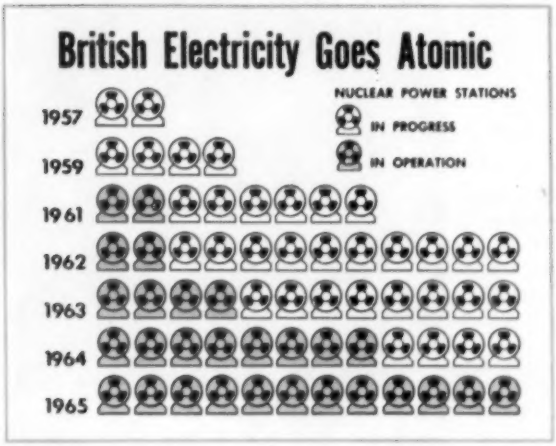
Advertisement

POPULAR SCIENCE MONTHLY'S . . . **Last-minute news & notes**

WOMEN--YOUNG ONES, ANYHOW--ARE SAFER DRIVERS than young men. The insurance companies say so, and back their belief with whopping rate reductions in most states. It will now cost papa as much as 23 percent less to let his under-25 daughter drive the family bus than it would to let his under-25 son take the wheel. The insurance people are not reckless enough to say that girls are better drivers--they may have fewer accidents because they drive less often, particularly during dangerous evening hours...A NEW KIND OF AUTOMATIC HEADLIGHT DIMMER, still experimental, uses a perforated scanning disk to keep out light from the sky and signs, which may fool present dimmers. It responds only to intense points of light, can even be rigged to disregard alternating-current lights (street and house lights) in favor of DC head lamps...AIR-INFLATED SEAT CUSHIONS in new Chevvy trucks have separate sections, each with its own hand pump, so that driver and passenger can make individual hardness adjustments.

A QUARTER OF ALL BRITAIN'S ELECTRICITY WILL COME FROM ATOMIC ENERGY by 1975, if an ambitious building plan just announced works out. The chart below shows the timetable for the construction of 12 atomic-power plants over the next 10 years. They will operate at the same cost as coal plants. By the 1970s, the British expect to build no more coal-burning power plants.

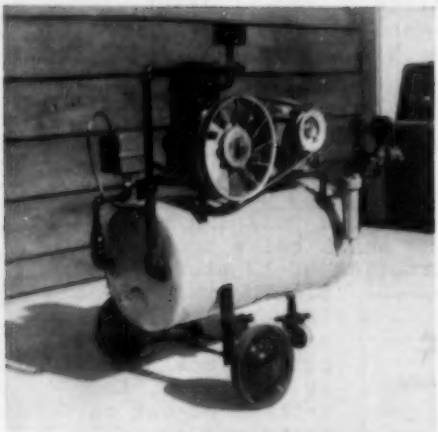


BABY FOOD FOR JET PILOTS? Jet jockeys can't take off their oxygen masks to eat, so the Air Force is testing a soupy mash of bananas to be piped right into the mask. It's something like baby food, but tastes better--they say.

AN UNDERWATER TV CAMERA INSPECTED THE COLUMBIA RIVER BED for Army Engineers planning The Dalles Dam. Previously they had used TV to check erosion at the base of the spillway of Grand Coulee Dam.

CRAFTSMEN AT WORK

Plywood Jails "Badmen." Giving in to TV and movie Westerns, Robert M. Kuntz Jr. of South Bend, Ind., built a playhouse jail for his own and neighborhood youngsters. Walls and roof are of exterior plywood. Carriage-bolt assembly on a frame of two-by-fours permits easy taking-down for winter storage.



Builds Paint-Spraying Rig. A workshop story in PSM (Sept. '54, p. 241) got William L. Tyner of Glendale, Calif., to experimenting and he constructed a spray-gun outfit using a 2-cyl. compressor. He welded a tank from the ends of two discarded water heaters and covered the stack hole. This left four pipe openings for the air lines, pressure regulator and moisture trap.

Tiny Engine Develops 10,000 R.P.M. This model-iceboat motor, built by Robert J. Huelsbeck of Menasha, Wis., has a ⅝" bore and a ⅝" stroke. Except for an aluminum-crankcase casting, all parts are steel or brass made with hand tools and a small lathe. Operation at speeds from 5,000 to 10,000 r.p.m. is with either a timer and ignition coil or a glow plug.

Bandsaw Takes 18" Work. Needing a heavy-duty bandsaw, Edison Kirschman of Prairie Home, Mo., built one out of two gas-engine flywheels and a wooden frame. Tension on various-size saw blades used is regulated by a threaded crank and nut which move the upper wheel assembly.

Launch a day of fun....'most anywhere!

—quiet fun, with an Evinrude

Outdoor America's most exciting discovery . . . TRAILER BOATING! Thousands will tell you there's nothing like it! You can explore famed vacation waters, or whisk your boat to lovely shores in easy reach. From highway driving to waterway cruising is a matter of *minutes*. Each launching starts a holiday of fresh adventure, new family fun.

Your boat? Your choice is wide—able fisherman, smart runabout, snug cruiser. Your motor? An Evinrude with *Whispering Power* . . . smooth as sailing! *And nothing less!* For this is the new *kind* of motor . . . so incredibly different from ordinary outboards . . . so amazingly *quiet* . . . so *smooth* . . . you have to ride with one to believe it. **SEE YOUR EVINRUDE DEALER.** Look for his name under "Outboard Motors" in your phone book. He knows boats, motors, trailers, and will gladly help you choose the right outfit for your needs. Time payments if you like. **FREE!** Write today for full-color catalog of the complete Evinrude line. **EVINRUDE MOTORS,** 4583 N. 27th St., Milwaukee 16, Wisconsin.

A Division of Outboard, Marine & Mfg. Company
In Canada: Mfd. by Evinrude Motors, Peterborough

all are quiet!

ELECTRIC BIG TWIN *Aquasonic*—25 h.p.* The *proved* electric starting outboard. $529†

BIG TWIN *Aquasonic*—25 h.p. Brilliant power for big runabouts, cruisers, water skiing. $430

FASTWIN *Aquasonic*—15 h.p.—speed to 30 m.p.h. America's "middleweight" favorite. $347

FLEETWIN *Aquasonic*—7½ h.p.—only 49 lbs. Top value in the light motor field. $235

LIGHTWIN *with famed Fisherman Drive*—3 h.p., 32 lbs. It "goes anywhere, stows anywhere." $145

*All ratings are OBC certified at 4000 RPM tested in conformity with SAE test code. Weights are approximate. †Prices f.o.b. factory subject to change without notice.

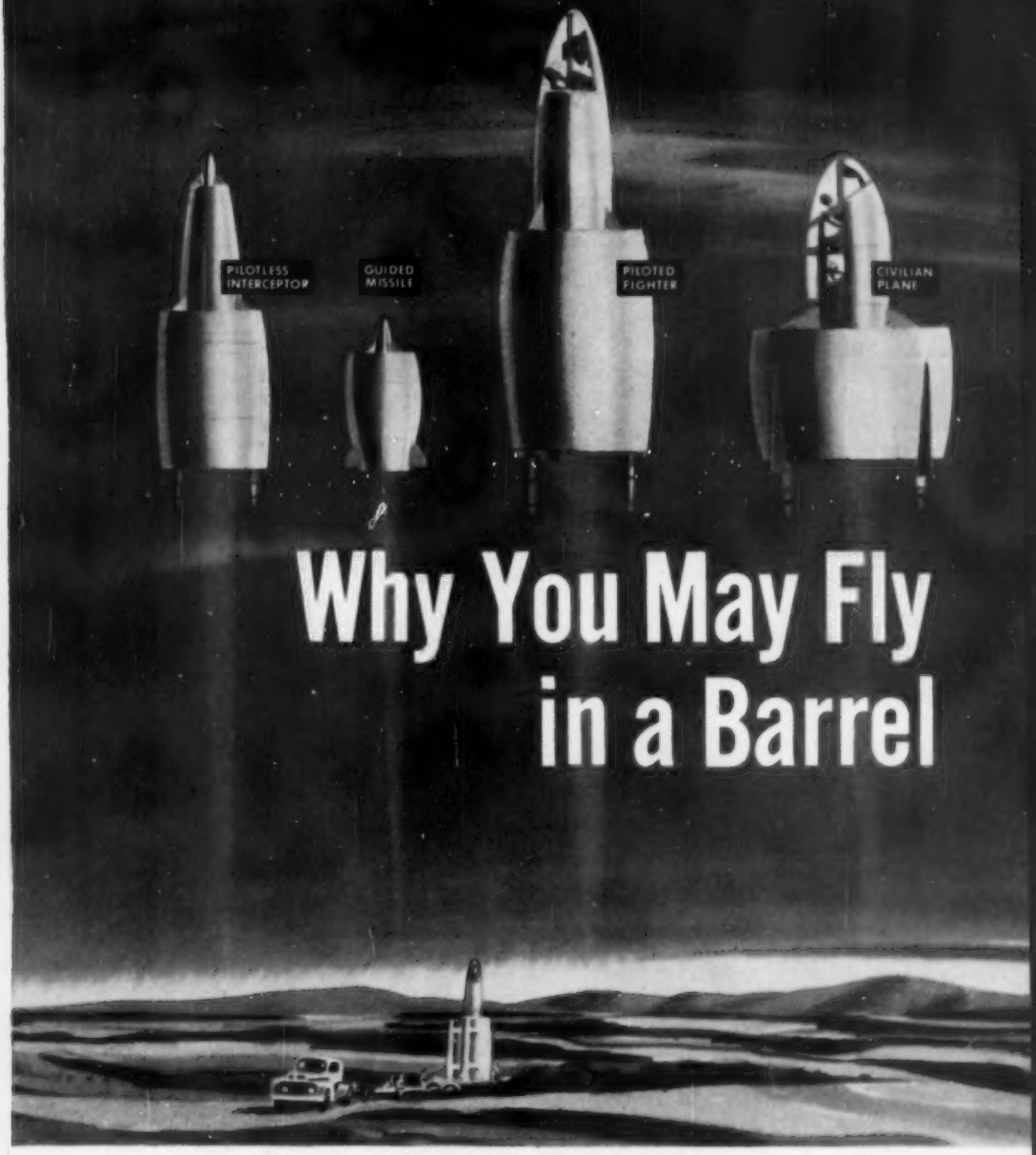
Evinrude

Pioneers in **quiet** *Outboard Motors*

Artist shows coleopter in level flight and, in diagram below, ascending and landing vertically.

Tomorrow's plane, say designers in France, will be a flying engine with a wing wrapped around it.

By Alden P. Armagnac



Why You May Fly in a Barrel

Principle can be applied in variety of aircraft for many uses, as these four examples show.

THEY'RE hatching a sensational mechanical bird in an aeronautical laboratory at Brunoy, near Paris, France. Quivering in gales faster than sound, wind-tunnel models give the spectator an exciting preview of what may be tomorrow's airplane. The barrel-winged craft looks more like a projectile.

It will take off straight up, like a rocket. Gradually it will level off into horizontal flight. Finally it will up-end itself once more, descend vertically, and alight,

as it started, on its tail.

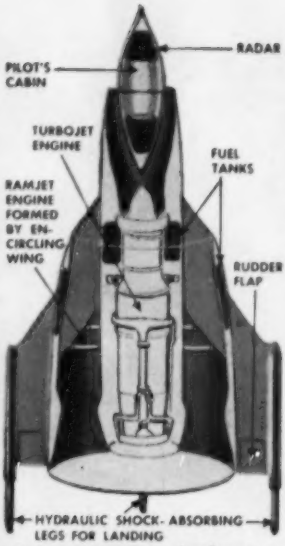
Under development by a French-German group of researchers, the fledgling craft is called a coleopter. An inexact but popular equivalent of its name would be "flying bug." It's a promising new member of the ultramodern family of aircraft designated by the magic initials V.T.O.—vertical take-off.

By matching both the vertical-rising ability of helicopters and the aerial performance of other types, V.T.O. planes would free aviation from dependence upon airport runways and carrier decks. Already the V.T.O. idea has inspired some of the most radical machines ever flown—America's tail-sitting "pogo" planes, England's fantastic "flying bedstead," and vertical-horizontal hybrids called convertiplanes.

But the coleopter, with its tubular wing, belongs in a class by itself. Finding nothing like it proposed before, France's Ministry of Industry and Commerce has granted more than a dozen basic patents for its design.

Bending its wing into a circle, its proponents explain, makes a single structural member do the work of two. The wing itself serves as the outer part of a jet engine, or as the duct of a ducted-propeller power plant. By saving weight, the range and payload are boosted. Moreover, a circular wing is strong, easily made and, since it is perfectly symmetrical, ideally maneuverable in the air.

For lift in level flight, a conventional plane's wing is mounted at a slight inclination to fuselage and air stream. The tubular wing, instead, is coaxial with the fuselage. So a coleopter supports itself by flying horizontally in kitewise fashion—the whole craft inclined a few degrees upward to the air stream. The lift then corresponds to that of a biplane, whose span equals the diameter of the circular wing.



CUTAWAY VIEW of coleopter shows it is virtually a flying engine. Here, barrel wing forms ramjet, to supplement turbojet at center.

Coleopters will serve both military and peaceful purposes. Here are examples of projects on the designers' drawing boards:

A guided missile called the Ogre, some six feet long and three feet in diameter, carries a shaped-charge warhead. Its ramjet engine hurls it at 530 m.p.h. to an estimated tactical range of 30 miles.

A pilotless interceptor, the 17-foot Charencon VI, climbs in two minutes to its 65,000-foot service ceiling. A ramjet engine supplements its turbojet power plant to give bursts of 1,300 m.p.h. speed. Radar and a television eye guide it to the target, which it destroys with cannon fire or rockets. Then it returns to base.

A light ground-attack plane, the 27-foot Bruche, flies at 900 m.p.h. under the combined power of a turbojet engine with an afterburner, and a ramjet.

A touring plane, the three-seat Hanneton II, is 19 feet long and has a barrel wing 20 feet in diameter. Two turboprop engines drive tandem propellers, whose thrust is enhanced by the wing-formed duct around them. This 280-m.p.h. plane of 620-mile range would be fast and economical for private flyers.

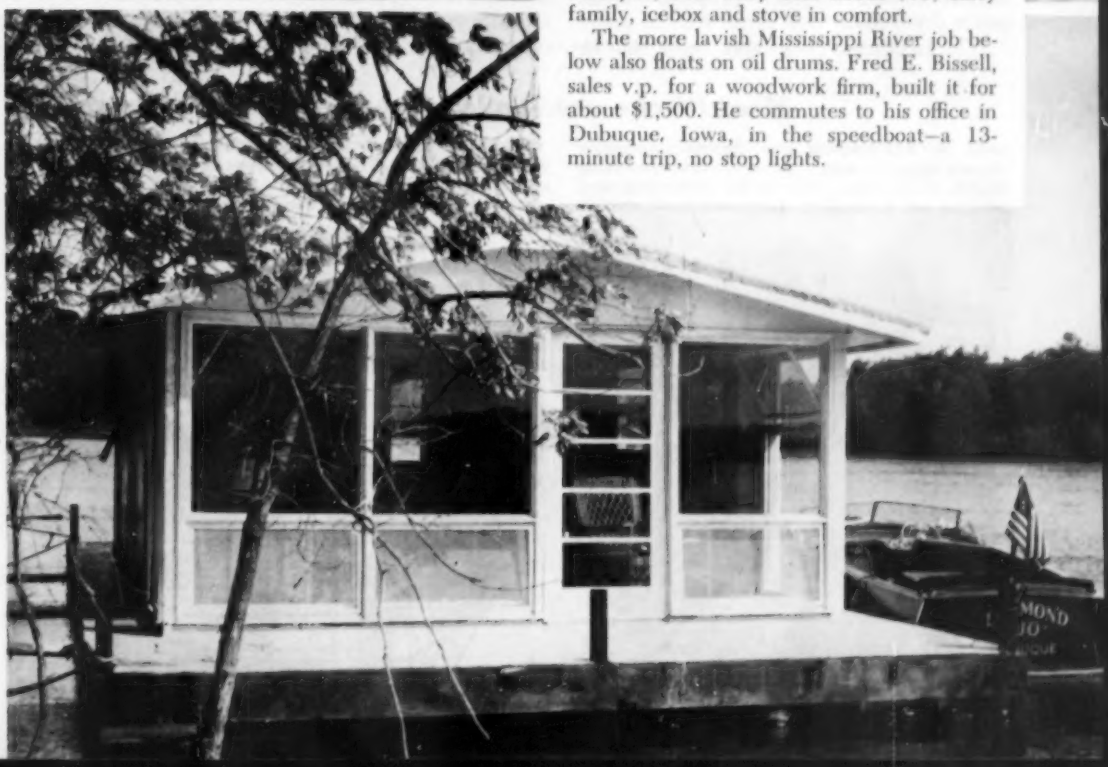
Occupants of coleopters remain comfortably upright in swivel seats, whether in vertical or level flight.

For short-to-medium-range air transport, the coleopter is the logical plane of the future, calculations convince a group of backers headed by Helmut von Zborowsky, Austrian-born engineer, and including Prof. Heinrich Hertel, former chief of development at Germany's great Junkers works. Participating with them in developing the coleopter is France's largest aero-engine concern. END

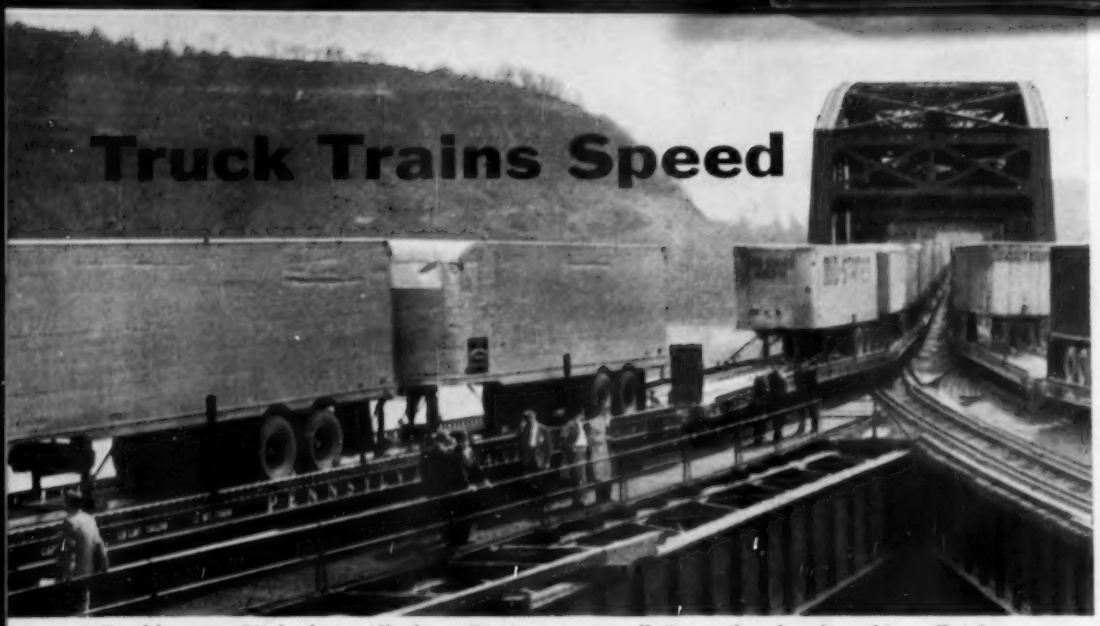
Houseboats Fit Any Purse

POOR-MAN'S yachts, they call outboard-powered rafts (like the one above) in Key Biscayne, Fla. They cost about $75, carry family, icebox and stove in comfort.

The more lavish Mississippi River job below also floats on oil drums. Fred E. Bissell, sales v.p. for a woodwork firm, built it for about $1,500. He commutes to his office in Dubuque, Iowa, in the speedboat—a 13-minute trip, no stop lights.



Truck Trains Speed



Double meet: High above Allegheny River at Aspinwall, Pa., railroad and trucking officials

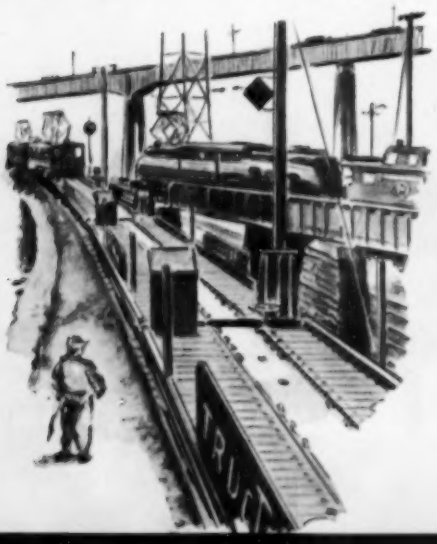
BY HAULING more than three-quarters of a mile of loaded truck trailers over its main line, daily, the Pennsylvania Railroad may already have added to your driving pleasure. And, if the predictions of its traffic department come true, this one railroad should take 2,000 trailers off crowded New York-Chicago highways by 1957.

The Pennsy calls this new operation "TrucTrain"—on other railroads it's "Piggy-back" or "TOFC" (trailers on flatcars).

Hauling truck trailers by rail is nothing new; the railroads have been doing it for more than 20 years. The big difference today is that the Pennsy, along with other lines, isn't limiting the service to its own trucks—a setup that competing highway carriers have always fought bitterly.

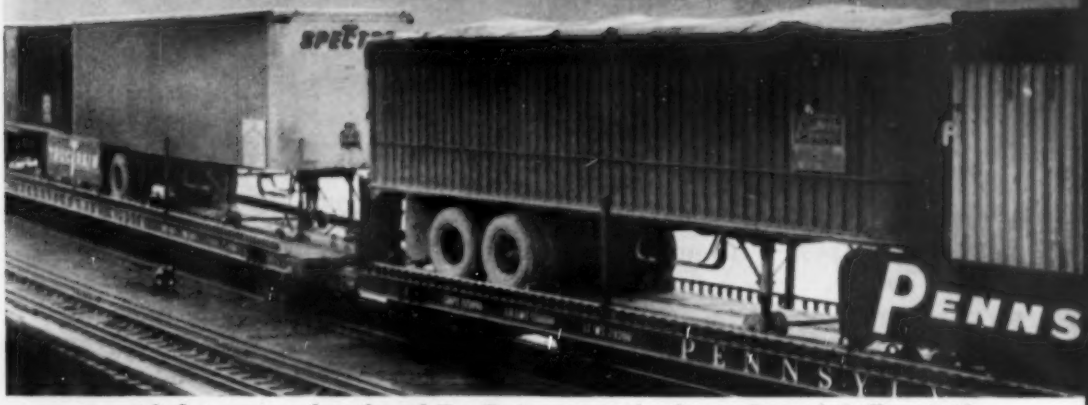
How trucks are loaded for the world's biggest

LATE IN AFTERNOON, an electric locomotive shoves flatcars onto six TrucTrain receiving tracks at Kearny, N.J. Brake staffs and end bridges are lowered so trucks can back aboard.



TRUCTRAIN TERMINAL accepts shipments for Chicago until 10 P.M. Trailers are weighed to determine railroad charge, are then hauled under this gantry to check clearances.

Cross-Country Freight



watch first west- and eastbound TrucTrains pass each other on Pennsy's Brilliant Bridge.

With TrucTrain, any common-carrier trucking outfit can put its trailers aboard a specially designed flatcar and have them whisked from New York or Philadelphia to Chicago in 29 hours.

A saving of about 10 hours over present all-highway schedules results. It also represents a slight saving in operating costs. The Pennsylvania Railroad charges $180 for its 904-mile New York-Chicago haul when the gross weight of the trailer is under 42,500 pounds.

Given the anticipated traffic, the Pennsy believes that TrucTrain should net $100,000,000 annually within the next five years. Some optimists are even willing to bet that with this closely integrated shipping service, the old-time railroad freight shed may soon be a thing of the past.—*Henry B. Comstock.*

piggy-back ride—New York to Chicago in 29 hours

MOTOR CARRIERS' TRACTORS are uncoupled, and special, railroad-leased trucks back trailers up concrete ramps and onto flatcars. Shipments are now the railroad's responsibility.

TYING A TRAILER to a flatcar deck is a five-minute job. Screwjacks, fore and aft, lift trailer weight just off the wheels; turnbuckle-adjusted chains provide counter tension.

How They Produce Cars Nowadays

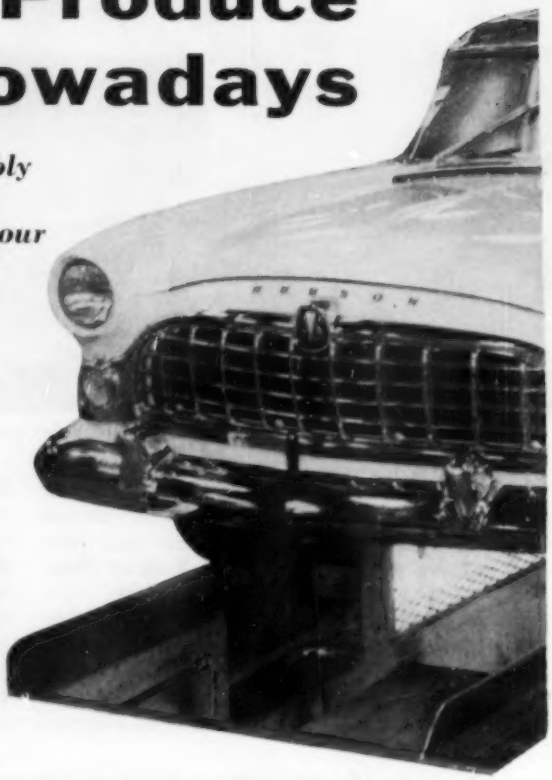
Take a look at a modern assembly line. In this cross between an army beachhead and a circus, your sedan draws its first breath.

By Frank Rowsome Jr.

ALTHOUGH mass-building cars is one of America's particular talents, the process is strangely unknown. Ask a man how he thinks his car was made and you'll likely get some shadowy images compounded of the Model T line 30 years ago and Charlie Chaplin being flummoxed by a monster machine. Actually, auto building has changed as drastically as cars themselves. Automation, new stamping and welding processes, and the steady refinement of assembly techniques have all reshaped the 1955 lines.

If you were to spend a week on a production line, you would no longer consider the familiar sedan in your garage a loyal but highly individual baby. You'd see it, instead, as a tricky contrivance of sheet metal, iron and glass—a bundle of nasty problems neatly solved.

You'd see it as something that was born in a couple of noisy hours, created by perhaps 2,500 pairs of hands, many of them female. You'd realize that its shape and behavior weren't just the doing of designers and stylists, but were controlled by inexorable laws governing what can be done quickly on an assembly line. You'd discover, too, that although your sedan may be as distinctive to you as a favorite fedora, skilled people worked hard to keep it from having any more individuality than the third egg from the left in a carton.



Nash-Hudson plant. The American Motors factory at Kenosha, Wis., is a good place to see new-style car building. Nashes, Hudsons and Ramblers are intermixed on the same final line there. If you count by major engine differences, this plant simultaneously manufactures six different kinds of cars. All these cars have "single-unit" bodies, which means that the classic dodge of slapping a frame on a conveyor and then screwing bits onto it won't work—because there is no separate frame.

This plant is geared to crank out 1,000 cars a day. Although other plants are bigger, it is extremely large. Everywhere inside the gates you detect a big-league approach. Eight or 10 enormous factory buildings sprawl across the landscape; a six-stack powerhouse hums with kilo-

TEN MINUTES OLD, this car, one of a thousand built each day, is about to graduate into the workaday world. Men shown are final inspectors who check hundreds of points on each car; more than half of them are in the pits underneath. Mechanism in foreground aligns the wheels.

watts; miles of railroad sidings snake between and through buildings; block-long queues of big trucks wait, bumper to tailgate, for their turn at the unloading docks.

The yards have the organized semi-confusion of a beachhead on D plus 3. Inside, you find that squirreling stuff away against the moment when it will be needed is a major part of the job. Racked engines and transmissions, heaped front ends, and mountains of wheels fill floors of big buildings, because a mass-production line is really a kind of gigantic and exacting cafeteria. Sad is the lot of the cook who doesn't have his chops—or castings—ready.

Central nervous system. Tucked off in a corner you find the offices of Al Pryse, a harried but courteous man who, with about 16 assistants, functions as the factory's central nervous system.

An order for a car is relayed from the dealer to Zone to Sales to Mr. Pryse. Knowing what kind of car is to be built, of what colors and trims, with what engine, axle, transmission and major accessories, his office then sends out instructions to each of the 26 places in the factory where different characteristics of a car are established.

At many of these remote places, workers load up subconveyors with the ingredients for this particular car. The subconveyors move in a synchronism calculated to bring each part to its own spot on the final line at just the right instant for the ordered car to flow together.

Major parts for the three makes come

PULLING STRINGS installs windshield. Man outside holds glass (already fitted with rubber channel) against opening. When loop of cord is pulled, rubber snaps around steel edge.

into Kenosha from all over the map: Hudson six-cylinder engines from Detroit, V-8 engines from Utica, Mich., big Nash and Hudson bodies from Milwaukee, and smaller bits from scores of places in the nation. The scheduling office makes sure that the right parts for your car reach the right spot at the right time.

Subconveyor lines hold different carfuls of parts. A front-end conveyor line, for example, is loaded up 200 cars away from final assembly, whereas other lines may be loaded 100 or 75 or even less cars back. This means that toward the end of a day, some pipelines are sequence-loaded with materials that are going to be used today and others with parts that will not be needed until tomorrow.

Scheduling instructions go out in code numbers on telautograph machines, complex gadgets that reproduce writing at the 26 locations about the factory. But they don't beautify a man's handwriting, and if a carelessly written code *7* is misread as code *1*, trouble can come popping.

"It sounds complicated," Mr. Pryse tells you with a smile, "but it works fine. Once in a blue moon somebody goofs and the wrong-colored wheels get loaded on the conveyor. We switch 'em later. Or maybe a car that's ticketed for an automatic transmission gets built with manual shift. The factory queries Zone to see if they'll accept it, and usually they will."

"With three different makes having six different engines all being built simultaneously, don't you ever accidentally put together a freak?"

"Nope. The system's pretty foolproof. Besides we really couldn't go far wrong—the parts wouldn't fit."

Cave of the welds. Next stop is where they build Rambler bodies, a vast and thunderous structure about as cozy as a dirigible hangar. It is a noisy, smoky cavern, peopled by goggled men (a few women, too) and by Indian files of big stampings marching overhead on conveyors. It's a place where you momentarily expect to be hit on the head from behind. Body fixtures—shapeless steel holding frames, covered with cam-locked clamps—march slowly along in orderly patterns over the floor.

The form of a car appears on them before your eyes: first the intricate underbody, then the "unisides" complete with doors and window openings, and then the big dished roof. It grows by several kinds of welding—arc in high-stress places, oxyacetylene for awkward locations, spot welding wherever practical. Mostly, great lobster-clawed spot welders bite the steel together in spurts of sparks. Elsewhere on the floor, grinders, inspectors, fillers and finishers swarm over the pewter-colored steel bodies as they inch along.

All the trimmings. Upstairs the bodies are cleaned, treated to prevent rust, and spray-painted—in part by darting automatic guns that squirt only when they "feel" a body going by. Two-toning calls for deft masking, not in the take-hours fashion that you or I would do it, but in fractions of a minute, using shaped aprons of cloth edged with adhesive. In the maze of mechanism it comes as a surprise to see occasional delicate handwork, as when wood-grain decals are adeptly stripped onto station-wagon panels.

Everywhere you see planning and deftness: when a girl or man needs a power tool, there it is floating in space a few inches away from the hand. Some workers take a 30-foot ride within each

body; some lean in the open doors, their feet neatly pacing the moving line; some hook on little castered seats and are towed along as they work. Windshield and rear-window glass, enclosed in rubber channel, is zipped into place within its metal frame when an encircling cord is pulled off, like the red tab on a pack of cigarettes. Then the finished bodies, calked and sealed, glide off to another building to meet their machinery.

Horsepower nursery. In the large buildings where engines are born the air is one of no-nonsense exactness. Parts fit just so, with no fiddling. Blocks from the foundry roll into elaborate face-bore-drill-ream machines that not only assail them with furious precision but also call for help if anything goes wrong. Engine build-up takes place on parallel moving lines: In go balanced cranks with flywheels and clutches pre-attached; in go rods and matched piston sets; on go cylinder heads, torqued up by nut runners.

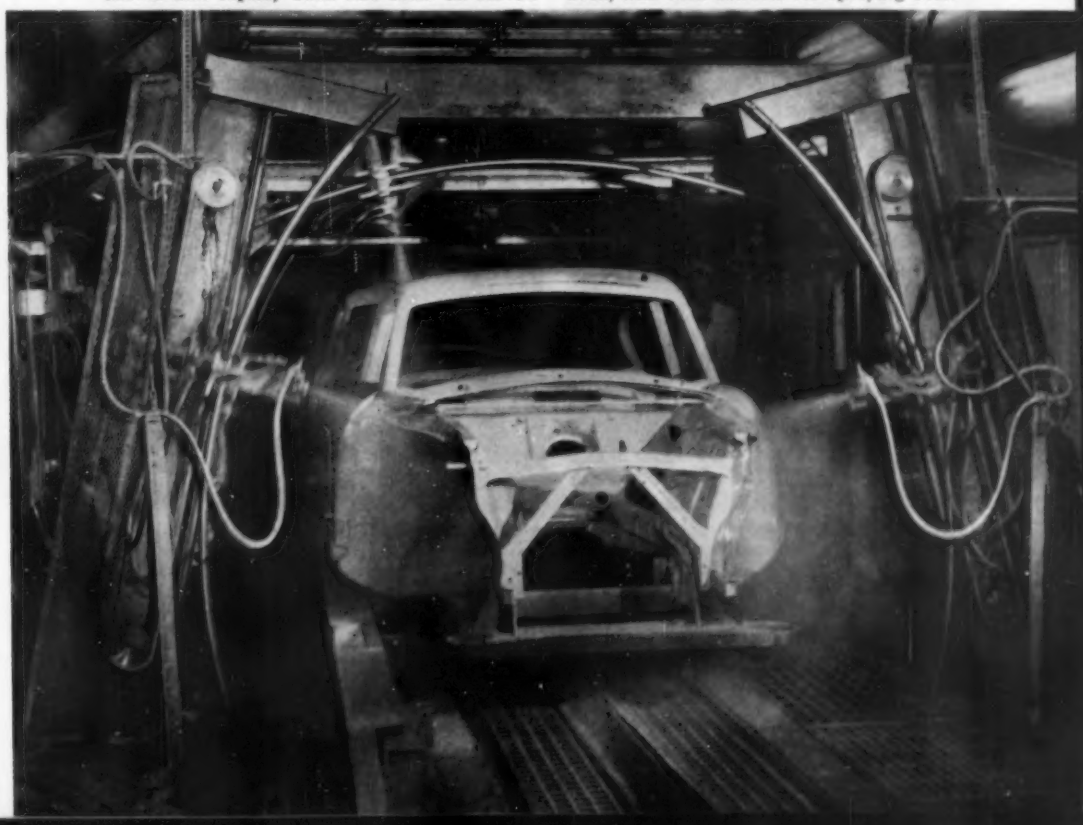
In Motor Test a man prepares a newly built engine for its first independent breath. In a few seconds he fits on water and exhaust lines, clips on a wire, swings a drain pan under the unplugged crankcase, and hooks a flowing oil pipe to the filler. (Any errant foundry sand or machining chips are flushed away.) On the carburetor throat he slaps a fitting that feeds cooking gas to the engine (it's safer indoors than gasoline), and touches the starter.

The engine starts. Instantly. Watching engines go by there for an hour, you note that they always start. "Well, why shouldn't they?" a workman says matter-of-factly. "Until the laws of physics get repealed, they can't *help* starting." Each engine runs at a brisk idle for 20 minutes, not for break-in but for hot setting of valve lash and spark timing.

The big show. Elsewhere complicated lines are turning out rear axles, transmissions and steering gear. But a visitor

[*Continued on page 254*]

AUTOMATIC GUNS do part of painting job. Three shown dart rapidly back and forth on curved tracks. Top one automatically drops to do rear deck, and then retracts for spraying roof.



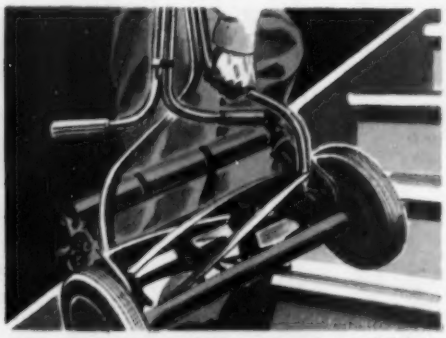
I'd Like to see them make...

A GLOVE-COMPARTMENT LOCK wired to the car's ignition system. Electromagnetic, it would lock automatically as the motor is turned off.—*Pvt. D. J. Martinson, Ft. Belvoir, Va.*

A MAGNIFYING GLASS that could be worn on a fishing cap and swung down before one eye to leave the hands free for tying flies onto a leader.—*I. G. Aylward, San Diego.*

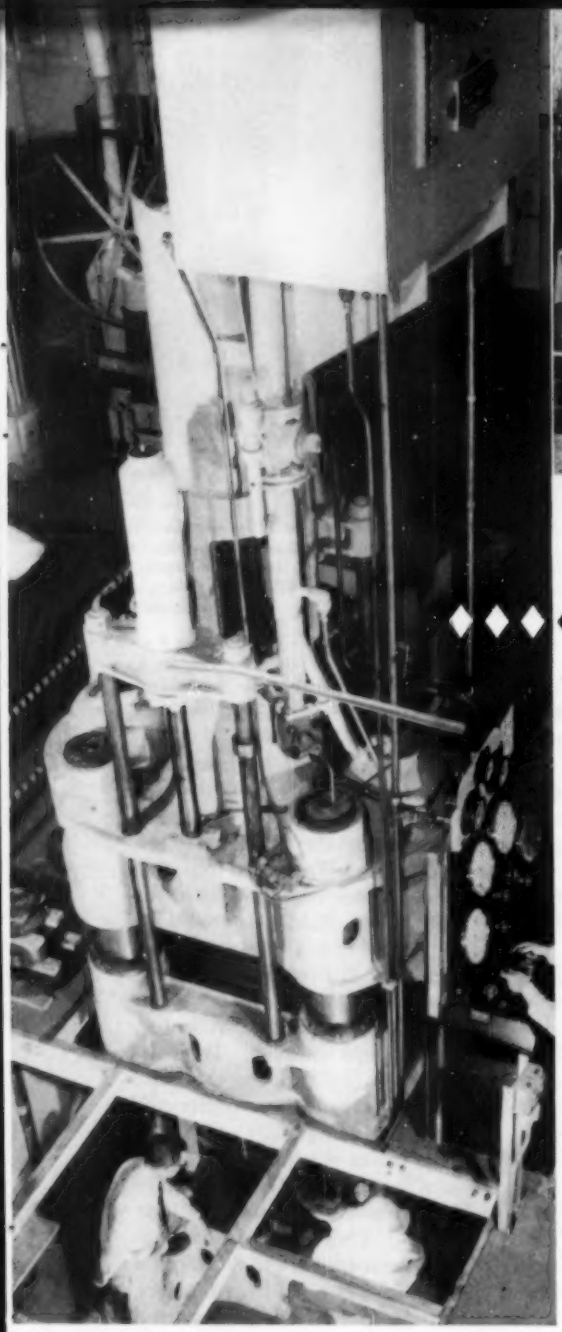
BUTTONS AND BUTTONHOLES on cloth strips for mending work shirts and coveralls. They could be sewed in place or ironed on with adhesive.—*W. I. Kaser, Baltic, Ohio.*

GARDEN-TOOL HANDLE GRIPS shaped like a pistol butt. They could be made of plastic with a metal collar for fastening to the wooden handle.—*B. M. Franklin, Hunter, Okla.*



A LAWN MOWER WITH A HANDLE that folds in half for carrying up basement stairs, then locks rigidly at full length for mowing.—*Charles E. Mieras, Grand Haven, Mich.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE MONTHLY readers. What is *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.



MIGHTY 1,000-TON PRESS makes diamonds in huge General Electric Research Laboratory. The two-story-high machine applies terrific pressure and heat to ingredients, in pit beneath openings in floor. For safety in case things fly, workers leave pit and run press by controls elsewhere, such as wheel on which man's hands rest at lower right of this picture.

COW BARN houses diamond-making plant of Vilella and Tomarkin, seen standing in doorway leading to modest 300-ton press with which they turn ordinary carbon into tiny gem stones.

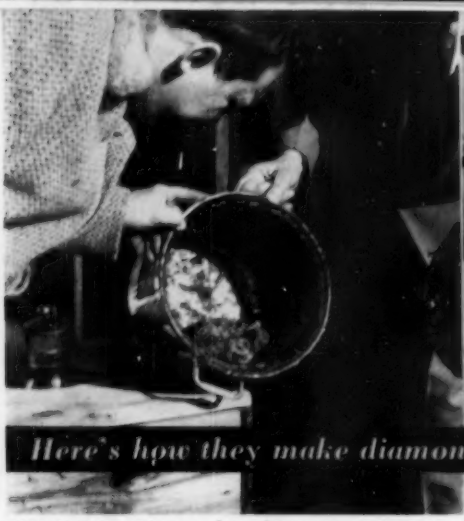
Diamonds Are Where You Make Them

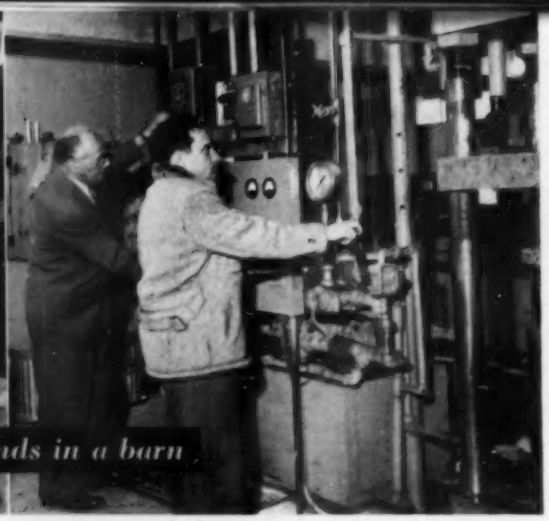
Success has crowned science's efforts to duplicate nature's prized gem in the laboratory.

By Herbert Yahraes

DIAMONDS have cropped up in odd places—among them, the eye of an Indian idol, the farm of a poor Dutch settler in South Africa, and certain meteorites. But for sheer unlikeliness, nothing beats the spots where the newest discoveries have been made.

One of these new diamond mines is in a famous laboratory. The other is in a cow barn. Adventurous scientists in both these places have finally succeeded in





Here's how they make diamonds in a barn

THIS BLACK STUFF, carbon from sugar, is raw material for diamond makers Vilella and Tomarkin. Batch shown above, they say, is enough to yield at least 25 carats of diamonds.

AT CONTROLS of their apparatus, Tomarkin (left) regulates current supply, and Vilella turns handles that operate the press, partly visible in the foreground at extreme right.

making diamonds—no mere imitations, but real ones.

You wouldn't stop to look twice at the new stones—all except one would be classified as diamond dust, and even that one weighs less than 1/100 of a carat. Another stone nearly the same size slipped away from someone's nervous fingers and was lost forever in the dust on the laboratory floor.

You could buy an equivalent amount of the diamonds produced so far—hundreds in each place—for perhaps $10 or $20. But the potential value of the processes for making them is enormous.

When General Electric held a press conference in mid-February to announce its achievement, a uniformed guard kept watch as reporters looked at the stones through microscopes. And the scientists in the cow-barn laboratory—who claim to have made diamonds before GE—have worked on a secluded estate protected with floodlights, watchdogs and a rack of rifles hanging near the diamond-producing press.

Diamond making has been one of man's recurrent dreams because these rare and precious stones are composed of carbon, and any organic material—a bone, a stick, a piece of wool—can be reduced to carbon simply by charring. Graphite in your pencil is carbon; so, mostly, is coal.

The difference between cheap and costly kinds of carbon lies in how their atoms are arranged. Immense heat and pressure can change the atomic pattern, or lattice, of ordinary carbon into that of the diamond. Deep in the earth, nature probably made diamonds that way.

Some 75 years ago a young Scotch chemist, James Ballentyne Hannay, tried to do the same. Into a heavy wrought-iron tube he poured hydrocarbons, bone oil and lithium. Then he welded the tube shut and threw it into a furnace. Eighty times he performed this dangerous experiment.

Most of his tubes exploded—like cans of beans in a bonfire—under the terrific pressure built up as they became red-hot. Three tubes held. They yielded tiny fragments that 25-year-old Hannay claimed were diamonds. Other investigators, however, had no success when they tried his method.

A later, more celebrated attempt, by Henri Moissan in France, stemmed from the observation that some meteorites contained tiny diamonds. To duplicate what had happened in space, Moissan

ALUMINUM CHAMBER, being inserted in press, contains ingredients to be subjected to big squeeze. Electric current, fed through cable meanwhile, raises them to high temperature.

AFTER THE SQUEEZE, Vilella slices chamber open with ax blade, and Tomarkin examines product —in this case, a metal alloy. Diamond-making chambers are smaller, but procedure is same.

first dissolved carbon in molten iron. Then he plunged the white-hot solution into a cooling bath.

Sudden chilling from the outside, he expected, would make the solidifying material contract, and exert pressure on the hot inside. And when he dissolved away the iron of his miniature meteorite, he found what he believed to be microscopic diamonds, crystallized from the carbon.

GE DIAMOND 1/16 in. long, at bottom of magnified view, is compared to diamond phonograph needle.

Moissan went on to win the Nobel Prize in 1906 for his discovery of fluorine and his development of the electric furnace. But whether or not his "diamond" crystals really were diamonds is still disputed.

Today's diamond makers owe most to another Nobel Prize winner, Percy Williams Bridgman of Harvard. When Bridgman began his work, the highest pressure a scientist could reach and measure was something like 75,000 pounds per square inch (psi). Bridgman extended this to the almost unbelievable figure of 6,250,000 psi.

The Harvard physicist was engaged in pure research. He didn't set out to do anything that would have immediate practical value; he harnessed high pressures because they were a tool for investigating the structure of matter. Strange things, Bridgman demonstrated, happen in the world of the super-squeeze. At 30,000 psi, for example, water freezes not at 32° but at eight below zero. Furthermore, a new kind of ice appears—one that is heavier than water instead of lighter. As the pressure increases, still different kinds of ice are formed: six altogether.

Carbon, in the form of graphite, was one of the materials that Bridgman worked with. He was curious, of course, to see if he could turn it into diamond. So were three commercial companies—General Electric, Carborundum and Norton. With their financial support, he developed apparatus that enabled him to put graphite under pressures as high as 450,000 psi, meanwhile subjecting it to enor-

mously elevated temperatures in the neighborhood of 5,000°F.

He made no diamonds, but he did show under what conditions of temperature and pressure *diamonds* would turn into *graphite,* and he was confident that the reaction could be reversed. "Further experiments," he reported in 1946, "are obviously called for."

A team of seven men was put to work at General Electric's vast research laboratory, at The Knolls, outside of Schenectady. Their mission: diamond making. The work began in 1950 under the supervision of Anthony J. Nerad, manager of the laboratory's mechanical investigations section. "When we started it," Dr. C. Guy Suits, GE's director of research, remarked recently, "I had the conviction it was as close to challenging the impossible as anything could be." But Nerad and Suits both knew that, even if the company failed to make diamonds, the experiments might lead to other valuable products.

HOW DO THEY KNOW they're diamonds? X-ray diffraction "fingerprint" of GE gem, above, clinches verdict of other tests.

For the diamond makers, the company bought a 1,000-ton hydraulic press, ordinarily employed for such jobs as molding metals. Such a press has a large ram—about 20 inches in diameter—but to reach superpressures the entire force of the ram must be concentrated against a tiny area.

In Bridgman's work with graphite, the ram acted against a thin piston, and the piston, in turn, bore down on the contents of the pressure chamber, which was 1½ inches in diameter and several inches long.

The walls of the chamber were made of specially treated steel and were surrounded by a supporting block made of five steel disks, each two inches thick. Even so, the tremendous pressures sometimes cracked both the central vessel and the surrounding block.

GE scientists ran into the same trouble. How they solved it is a trade secret, but they've been making their diamonds in a smaller chamber ringed by thick, concentric bands of metal, possibly a new alloy. Electrical heating can maintain a temperature of more than 5,000° within the chamber for a long period.

In this small chamber the scientists placed "a carbonaceous material." It may have been largely graphite, which Bridgman used; charred sugar, which Moissan used; or a variety of other carbon-containing substances. Real diamonds often contain some ash, made up of the oxides of various metals — iron, calcium, magnesium, aluminum, titanium—and of silica. So the scientists may have added a dash of similar ingredients.

The early years brought many setbacks. Some were easy to explain—for example, a chamber would crack because it simply wasn't strong enough to withstand the pressure and heat. But for others there was no quick explanation. Earlier workers had calculated that graphite ought to become diamond under great heat and at a pressure of something like 450,000 psi. But to find just the right pressure and temperature—and just the right length of time to apply them—the scientists had to progress by trial and error.

Finally, one day last year, a 46-year-old physicist, Dr. Herbert M. Strong, removed the pressure chamber from the 1,000-ton apparatus, opened it, and found that the contents had solidified. That was an old story. But when Strong took the hard little capsule that had once been a soft "carbonaceous material"

[*Continued on page 264*]

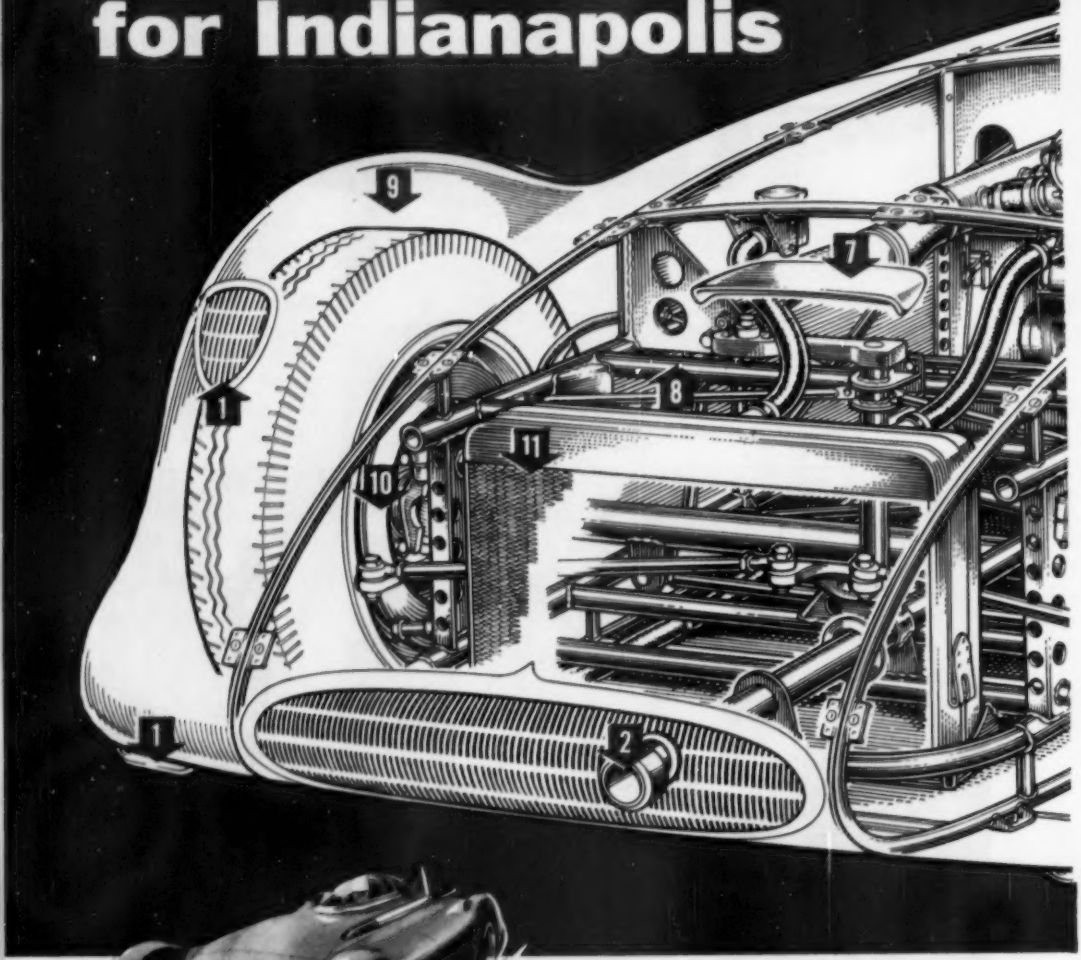
Plastic Bubble, Swimming-Pool Size, Hides Radar

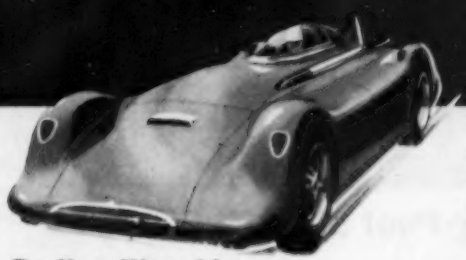
IT TAKES the biggest plastic part ever made for an airplane to cover the underslung radar antenna on one of the Air Force's picket planes. These Super Connies, crammed with six tons of electronic gear, recently began patrol off the Atlantic coast. From their guard lines high in the air, they detect aircraft many hundreds of miles farther away than land-based radars can.

The giant bubble—ample for a family swimming pool—consists of two pieces joined together. Zenith Plastics Co. makes it.

Designer of speedway winners builds

A Racing Saucer for Indianapolis



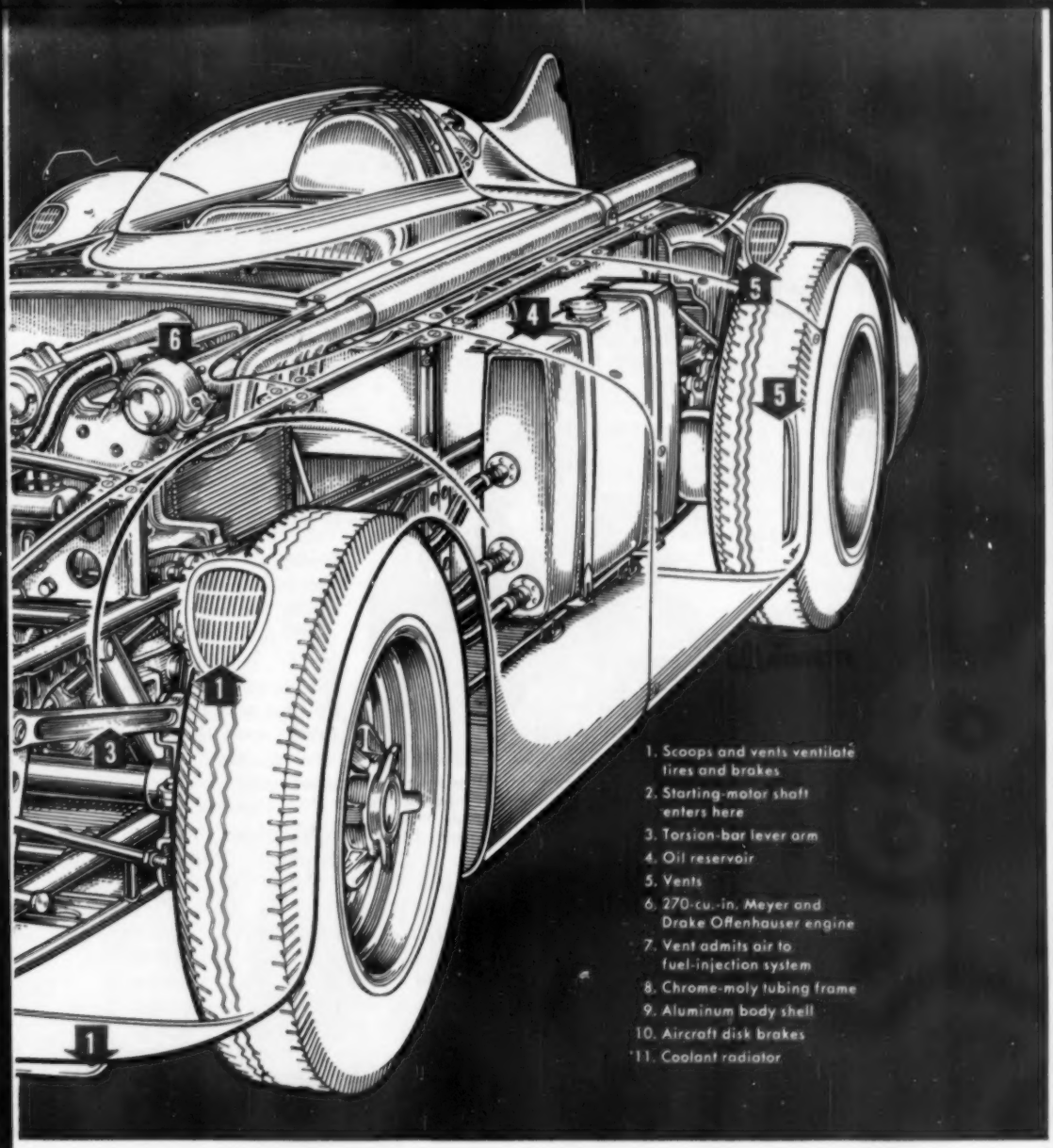


By Ken Kincaid

FOUR times in the last five years, cars built by Frank Kurtis of Los Angeles have won the classic Memorial Day race at Indianapolis. The soft-spoken, six-foot-four Kurtis at 47 is the dean of U. S. race-car builders. He has seen his creations lead the field more often than anyone else in recent racing history.

This year, instead of betting on the sure thing that his cars have become, he's taking his chances on a new and radical design—a fully streamlined car. Win or lose, it will be worth watching.

It is as startlingly different-looking as



a flying saucer. It has enclosed wheels, a big tail fin and a plastic bubble over the driver.

Last October, Kurtis first outlined his idea for this car to millionaire sportsman Chapman Root of Terre Haute, Ind.

"It'll either be a bomb or an outright dud," he told Root. "But I think it'll really fly."

"You build it," said Root. "I'll buy it."

Kurtis has acted on the theory that if a little streamlining is good, a lot should be better. But complications result from improved streamlining.

Take, for example, the question of enclosed wheels. The exposed tires and brakes of an ordinary racing car are obviously responsible for a lot of wind drag. But tires and brakes take brutal punishment in a race. Plenty of fresh,

cool air can save them from quick destruction. Chopping off the unlimited supply of air they get when they're exposed may be risky.

Kurtis feels that he has licked this problem. Above and below the tips of his car's front fenders, he has built openings that will admit huge amounts of fresh air to draw the heat off the front tires and brakes. The air then is guided into wide tunnels to cool the rear tires, brakes and rear-axle assembly.

Streamlining creates other problems, too. The more a car is streamlined, the less you can expect wind resistance to help slow it down. So the Kurtis-Root car will put a greater load on its brakes than previous Indianapolis cars. To minimize this disadvantage, Kurtis is using a new type of aircraft disk brake, with twice the usual friction surface.

FRANK KURTIS shows how exhaust header on Offy engine will occupy unorthodox position, rising upward alongside cockpit. Cooling air will keep heat from driver.

The bubble over the driver's seat will counteract the wind drag of the traditional open cockpit. But, in a race, the car ahead may spew enough oil on the bubble to make it impossible to see through. So it would be dangerous in competition. Kurtis knows no reason, though, why the canopy can't be used during qualifying trials, when only one car at a time is on the track, and when the all-important starting positions are determined.

A front position in the starting lineup of the Indianapolis "500" means that the driver will have an easier time blasting through the fantastically fast and crowded first turn, and have less traffic to contend with as the ranks of cars stretch out. Kurtis figures that using the canopy should increase his car's speed by around a half of one percent.

This may not sound like much, but it's seven-tenths of a mile an hour, and starting positions are often decided by bare hundredths. For the "500" itself, the bubble will be replaced by a low windscreen.

The big fin that tapers back from the streamliner's headrest will probably stir up hot arguments among the railbirds at Indy. Many of them are likely to think that it's a "stabilizer," like those used by straightaway record cars to keep them on the beam. But Kurtis maintains: "It's no stabilizer. I call it a 'spoiler' and I hope it works."

The big man whose cars have ruled the roost at the Speedway suspects that the vacuum that fills the wake of any fast-moving object cuts down the car's aerodynamic efficiency. So he has designed his streamliner's tail fin in a way that will partly spoil the creation of a trailing vacuum.

"Maybe it's just a wild guess," he says, grinning, "but anyhow I like the way that fin looks. It could mean a whale of a lot."

How big a difference the fully streamlined body will really make will not be known until driver Jimmy Daywalt takes the car around the Indy oval at thundering full throttle. Then the answer will be clear. Kurtis will be running five other brand-new racers that are practically identical to the streamliner except for the wheel-enveloping aluminum body. Like "controls" in a scientific experiment, they will put the finger on any advantages resulting directly from better streamlining.

Kurtis expects the streamliner to be faster by at least two percent, or nearly three miles an hour per lap. If Kurtis and Root, who has an initial investment of $25,000 in this car, have guessed right, big-time racing will never again be the same. END

This X Ray Uses Hot Atoms

RADIOACTIVE isotopes created in an atomic furnace now make possible lightweight, easy-to-carry X-ray machines.

An experimental Army unit (above) uses "self-developing" film that requires no darkroom. After exposure, a pull on a tab releases chemicals to process the picture.

A civilian version (right), called the Iso-X, is made by Litton Industries, 336 N. Foothill Rd., Beverly Hills, Calif. Both machines use radioactive thulium to generate their X rays.

Sea Serpent? Just a Gray Whale

LIKE a weird sea monster, a gray whale bobs his head above water for a suspicious look at the photographer, Raymond M. Gilmore of the Fish and Wildlife Service. He chased the 40-foot animal in an outboard-powered rowboat to get his pictures.

Camera Guards Robot Tollgate

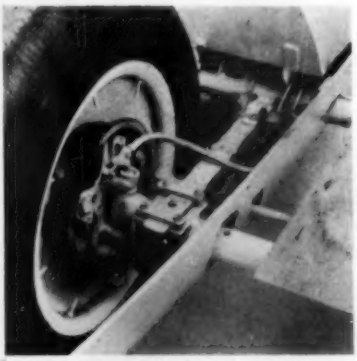
You can't short-change the mechanical toll collector just installed at New Jersey's Garden State Parkway. Put any less than 25 cents in the hopper, and a camera in the box atop the sign snaps a photo of your license plate as you drive off.

DOUBLE-TANKER is ready for trial run, with driver in his twin hull. Spider gears link engine to rear axle. A 50-pound battery behind the driver helps balance engine weight.

Siamese-Twin Hot Rod Guns for 260

A PAIR of F-84 airplane drop tanks skimmed the surface of a California dry lake not long ago at 150 miles an hour. A man rode in one, a cut-down DeSoto engine in the other. Chrome-moly tubes and two rigid axles encased in more tubing linked the tanks together.

Howard Johansen, a Los Angeles cam maker, built the car to test the speed possibilities of twin bodies, with their reduced wind resistance. The car's 1,500 pounds pushes into the wind a frontal area of only seven square feet, about half that of a conventional hot rod. Johansen figures he'll top 260 on long straightaways.



UP FRONT, leaf springs from a Hudson suspend the body. The hydraulic line leads to a Dodge front-wheel brake. Installed at the rear, which is springless, are spot brakes from an F-80 fighter and the differential housing which Johansen took from a '34 Ford.

OPENED POWER HULL shows fuel tank behind engine, a DeSoto sleeved down to 257-cubic-inch class. Magneto ignition sparks engine which is controlled by driver through a push-pull cable. That's builder Johansen with the hat, checking his engine.

Capital is the first U.S. line to go turboprop.

You'll Like Turboprop Flight

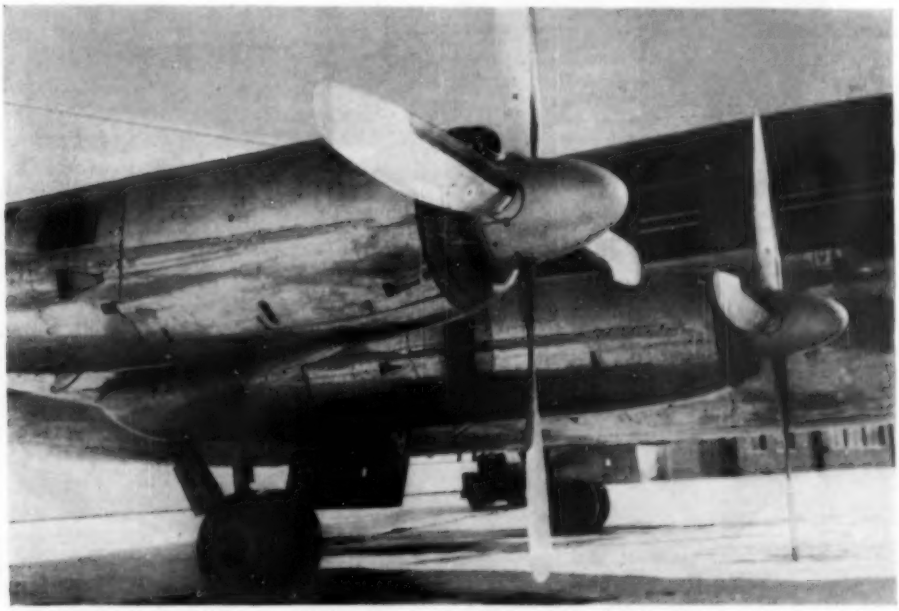
A veteran air traveler takes you with him on a new kind of liner now flying U.S. airways.

By Herbert O. Johansen

ON MY first flight in a Vickers Viscount turboprop, nine beautiful stewardesses vied with each other to keep me—the only passenger—comfortable, well fed and happy as we sped 440 miles an hour, 27,000 feet up.

Beautiful stewardesses in abundance are not a characteristic of the turboprop. They were along because it was a training run, between Winnipeg and Toronto, arranged by Trans-Canada Air Lines before putting the first of 22 turboprop airliners into scheduled service.

My preview flight was made about a month before a Viscount was to whine down to a landing at New York Inter-

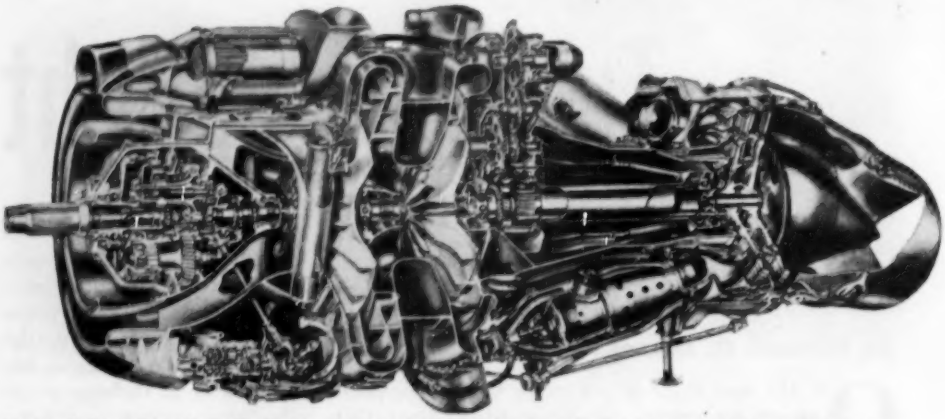


Here's what makes plane go. Vickers Viscount airframe was designed around these engines.

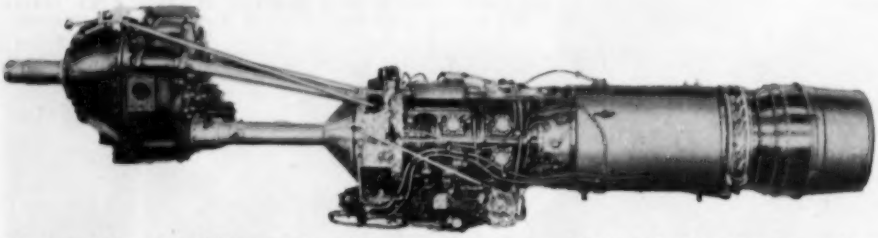
national Airport, introducing turboprop service to the United States. More air travelers in this country will soon become familiar with that characteristic whine as Capital Airlines replaces its entire fleet of piston-engine planes with 60 of the British-made Viscounts.

Although I have flown hundreds of thousands of miles in almost every type of airplane, this flight was a unique experience.

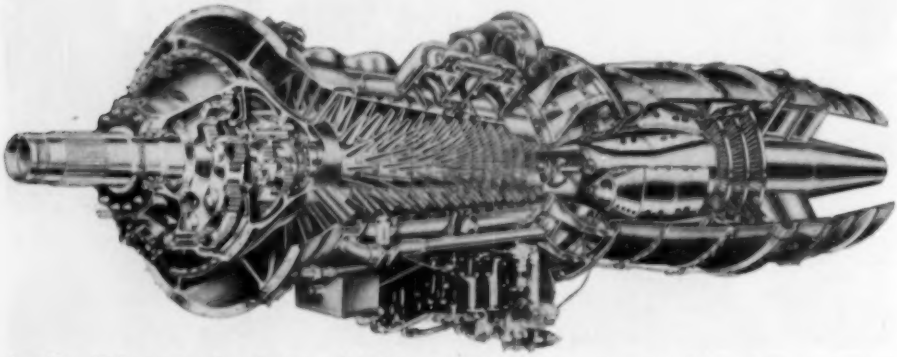
Our pilot climbed to 27,000 feet to get above bumpy weather and to take advantage of a 100-mile-an-hour tail wind.



Four of these British Rolls-Royce Dart gas-turbine engines power the new Vickers Viscounts.



A gas turbine, too, Allison engine above may run tomorrow's U.S.-built turboprop airliners.



Another U.S. contender, Pratt and Whitney PT2, turboprop-powers Navy Super Connies.

Turboprop power enabled him to climb 1,800 feet a minute—about twice that of a similar piston-engine plane. Thus we were able to get up there quickly enough to make it worth while for the short distance to our next landing.

The Viscount's cabin, pressurized to a comfortable 7,000 feet (no ear buzz and my Zippo cigarette lighter worked perfectly), kept us from noticing the altitude. The four 1,500-horsepower Rolls-Royce Dart gas-turbine engines, with a normal cruising speed of more than 330 miles an hour, combined with the strong tail wind, let us cut almost in half the scheduled piston-flight time between Winnipeg and Fort William-Port Arthur airport.

An increase in speed that will, on regular runs, cut half an hour off a two-hour hop is certainly a feather in the Viscount's prop. But what impressed me most about my turboprop flight—let's forget those hostesses now—was the low level of vibration. There was some vibration, of course, but still I did (as advertised) balance a pencil on end. The greatest boon of this lack of the flying shakes, however, was that I was able to sleep, something I have rarely been able to do before on short flights. And there was plenty of room to stretch out for sleep in this 40-seat, two-abreast version. Capital has announced a 48-seat version.

Turboprop flight is the next thing to jet flight. The Viscount's gas-turbine engines are the same type that speed supersonic jets. The main difference, aside from less power, is that the energy is harnessed to propellers as shaft horsepower instead of being blown out through the tailpipe as jet thrust. With only one big moving part, and that rotating, far less vibration and noise is transmitted to the fuselage than with piston-pounding power plants.

"Noiseless," like "vibrationless," has been loosely used in describing turboprop flight. Of course there is noise. In fact, sitting by the window on the port side of the Viscount in flight, I asked a Trans-Canada representative, "Stan, what's all this about no noise? I don't

BIG, OVAL PICTURE WINDOWS make it unnecessary for Viscount's passengers to crane their necks for a view of the scenery below. Light reflections make the glass look fuzzy.

"LOOK, NO VIBRATION," says Trans-Canada stewardess Muriel Ryan. She is balancing a pencil on end for me in the aft galley of the Viscount during our preview flight.

THERMOMETER READ 20 BELOW as we deplaned at Winnipeg. That is why Trans-Canada is using a special cold-weather fuel. Capital Airlines' turboprops will burn ordinary kerosene.

seem to notice very much difference."

"Well, it's a different kind of noise," he said. "You'll get used to it."

Only then did I become aware that Stan was sitting at the window seat across the aisle from me. I had talked in a normal voice. There had been no cupping of ears, no "Eh, what was that you said?" And when we stepped off the Viscount on our arrival at Winnipeg, I found that I wasn't shouting at the people around me for the next half-hour.

Now that Trans-Canada and Capital have settled the question whether passengers would be able to fly jet or turboprop first in this country, the question takes a new form: "Will we see more turboprops on U.S. airlines before a commercial jet transport comes along?"

The answer is yes. ***Faster four-engine planes*** to replace twin-engine equipment on short-to-medium hauls—for which the turboprop is a natural—are being sought by several airlines. When British European Airways put Viscounts on its continental routes, they hogged the business.

BUCKY, mascot at Sault Ste. Marie, Mich., watches wistfully as a Vickers Viscount takes off during the training flight described by the author.

American Airlines, our biggest, is eager to get a turboprop for short and middle distances, as well as a turbojet for long range. What American wants for the short hops, as a replacement for its two-engine Convairs, is "a four-engine airplane capable of transporting 50-60 passengers, with turboprop engines, at a cruising speed of 350-400 miles an hour." Four manufacturers have submitted proposals. The details have not been announced, but reports are that essentially this is what they have to offer:

- A Convair 340 modified to take four turboprops, which would probably be more powerful versions of the Dart used on the Viscount.
- A Douglas DC-6 with a shorter fuselage—the full length is not needed on short-range service. It would be powered by either American or British turboprop engines.
- A brand-new Lockheed airplane, using four U.S. turboprops.
- A new Vickers Viscount, but with more powerful Rolls-Royce engines not yet in production.

Lockheed, meanwhile, is redesigning a Super Constellation, with a longer fuselage and thinner, longer wings, to take turboprops. This L-1449 would have a speed of over 450 miles an hour, a range of about 5,000 miles. There is also talk of modifying the Douglas DC-7 as a luxury turboprop for the cross-continent and transatlantic trade.

Always it's the engine that sets the limits of an airplane's performance. More powerful, more efficient piston engines have given us faster and bigger planes over the years. But the piston engine has about run its course. As perfected today, the best it can deliver is about one horsepower for one pound of weight. A single engine weighing 4,000 pounds is deemed to be the maximum that can be handled with aerodynamic efficiency. If we want more than 4,000 horsepower, the piston engine becomes too heavy, too big, too complicated.

The turboprop, however, delivers two horsepower or better for a pound of weight. The jet does considerably better even than that—but at very high speeds (better than 500 miles) and very high altitudes (40,000 feet). But the jet is a glutton for fuel and, for commercial use, would pay off only on long-range flights. The turboprop, while slower, nurses its fuel. It can handle short-to-medium-range hauls, while also capable of very

[*Continued on page 292*]

Tape Recordings Chase Gulls to Make Airfields Safer

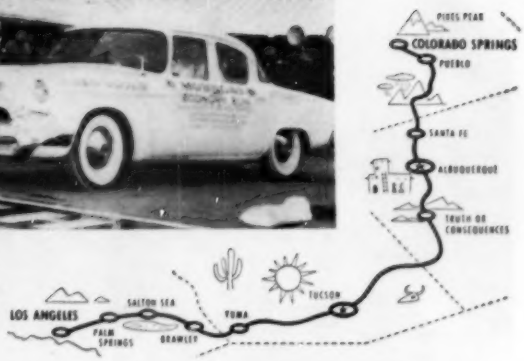
THIS captured sea gull may save a pilot's life. How? His pals, seeing him in trouble, sound a distress signal to scare the flock away. That alarm call, recorded on tape, can then be played to frighten other gulls away from coastal airfields, where birds sometimes smash into windshields and cause plane accidents.

Falling Pinwheels Drop Supplies

A NEW way to drop supplies from airplanes uses helicopterlike blades instead of a parachute. The blades, which unfold and telescope out when the container is released from the plane's bomb rack, are spun by the air stream to float their load gently to earth. Developed by Kaman Aircraft for the Marines, the Rotochute can be dropped from planes flying fast and low.

Spinning Book Tells the Story

THIS child's book can talk and sing. Its plastic cover is a phonograph record of songs and sound effects to supplement the story printed on the pages inside. A hole through the middle of the entire book lets it fit on a phonograph. Originated by Bernard and Darlene Geis, Magic Talking Books are published by John C. Winston Co., 23 Foster Pl., Hempstead, N. Y.



CHAMP FUEL MISER completes 1,323-mile run in 32 hours, 50 minutes. The route dipped to 218 feet below sea level at Salton Sea, climbed to 9,382 crossing icy La Veta Pass in Colorado. Stars on the map at right show where the cars stopped overnight.

Studebaker Wins Gas-Saving Race

IN MIDTOWN Los Angeles, before dawn one morning recently, Dick Johnson hopped into a new Studebaker Commander and, with 21 other light-footed drivers in 21 other precisely tuned 1955 cars, took off across the desert for Pikes Peak.

When he pulled up three afternoons later in snow-spattered Colorado Springs, Johnson had driven close to 450 miles a day, at a brisk 40 m.p.h. average, on less than three tanks of gas. Considering its weight, his Studie V-8 led all the rest in the 12th annual Mobilgas Economy Run.

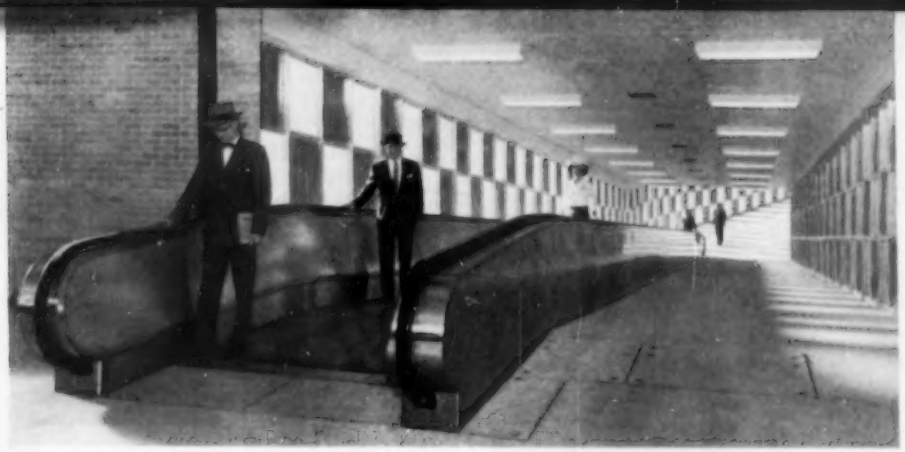
The payoff went not to actual gas mileage, which would have made it a cinch for the small cars, but to ton-miles per gallon. AAA referees figured this by multiplying car weight in tons by miles traveled, then dividing by gallons of gasoline used.

This year, for the first time, all cars in the run had automatic transmissions. The field averaged 2.79 miles a gallon less than the standard-with-overdrive models among last year's entries.

HOW THEY RAN:

MAKE & MODEL	DRIVER	MILES PER GAL.	TON-MI. PER GAL.
LOW-PRICE CLASS			
Rambler Super 6	Les Viland	27.4733	51.2789
Ford Fairlane 6	Marshall Martin	22.8197	48.7201
Chevrolet Bel Air 6	Pete Novotny	21.5631	47.3203
Ford Fairlane V-8	Bill Hooks	20.5979	45.7892
Plymouth Belvedere V-8	Ackton Miller	19.3683	43.7723
Chevrolet Bel Air V-8	Jim Rush	19.6406	42.2862
LOW-MEDIUM PRICE			
Studebaker Commander V-8	Dick Johnson	27.4366	58.6320
Pontiac Chieftain V-8	Archie Bowen	21.6149	51.9297
Mercury Monterey V-8	Art Elliott	21.5866	51.9157
Hudson Wasp 6	Lee Hamer	22.1220	49.9957
Dodge Coronet V-8	William Losher	Disqualified	
UPPER-MEDIUM PRICE			
Nash Ambassador 6	Pierce Venable	25.1854	58.5560
Oldsmobile 88 V-8	Woody Bell	22.5543	56.8707
Studebaker President V-8	Robert L. Donkin	25.2901	55.1957
Dodge Custom Royal V-8	Danny James	22.3287	52.2267
Hudson Hornet 6	Hart Fullerton	20.6544	48.7857
Chrysler Windsor V-8	Mel Alsbury Jr.	18.2294	47.0683
DeSoto Firedome V-8	Verne Holmquist	17.8962	43.8635
HIGH PRICE			
Buick Roadmaster V-8	Al Cottle	19.7827	53.7596
Packard Patrician V-8	Harold Michelson	18.7515	51.6322
Lincoln Capri V-8	Art Rene	18.8780	50.3666
Chrysler New Yorker V-8	Lew Jabro	19.0170	50.1099
Average, All Cars		21.5615	50.4798

Sweepstakes Winner: Studebaker Commander
Average Speed, All Cars: 40.6543 m.p.h.



Rodeo-Bound Texans Get There Faster on Moving Sidewalk

THIS moving sidewalk saves Texans a 114-foot hike at stock shows and rodeos in the Houston Coliseum. Set up on a bridge from the parking lot, the endless rubber belt moves over steel rollers to carry crowds up a 12-foot rise. It reverses its direction when the show is over. Goodrich and Link-Belt engineers teamed up on the project.

PAINTER SPRAYS ROOFING PAPER with white traffic lacquer. Within seconds, before lacquer is dry, another workman sprays the paper with tiny glass beads that sparkle under light.

Paper Strips Guide Cars Around Road Work

To SHOO traffic off parts of new roads still under construction or to route cars around sections of old road under repair, highway men in California make their own temporary markers. Cut from black roofing paper painted white and coated with beads that reflect light, the strips cost only a few pennies apiece. The paper can be taken up easily and leaves no marks to confuse motorists when the road work is finished.

CUT STRIPS laid down in parallel pairs divert traffic to one lane of new road. An ordinary pocketknife is used to cut four-inch strips across the width of the roll of paper.

ROLLER PRESSES STRIPS down into hot paving. On old roads under repair, strips are stuck down with asphaltic emulsion. A shovel pries them loose when they're no longer needed.

Marsh Digger Opens Everglades

SPORTSMEN may soon be penetrating the mysterious Florida Everglades. A marsh digger (above) is cutting through waist-high vegetation, leaving "water trails" in its wake. Like a flat, steel-hulled motorboat with rotary blades at the "prow," it digs channels wide and deep enough to be navigated by canoes and small motorboats.

Shaker Keeps the Salt Pouring

SALT can't clog in this shaker. The hinged lid is fitted with tiny spikes that fit into the pouring holes to keep them clear of caked salt and to seal them against dampness when the shaker is not in use. Finger pressure pops up the spring-held lid. Invented by a German who got tired of pounding at clogged salt, the shaker is made by Steinberger & Vorsanger A.G., Am Schlachthof 1, Wiesbaden.

Outside Switch Lights Room

THERE'S no fumbling for the light switch in a dark room with a new German system. The switch box is placed outside the door, just above the lock, so that you can snap on the light before turning the knob. The switch is connected to the house circuit through a special hinge. Shown here on the door of a hotel room, the inventor expects the switch to be used in private homes, too. Dr. Deisting & Co., G.M.B.H., Kierspe, Westphalia, Germany, makes it.

Plastic Body Serves as a Chassis, Too

THIS plastic three-wheeler has no chassis—it's made in two pieces with the reinforcing structure molded into the underhalf. Just under nine feet long and only 53 inches high, the experimental Stationette seats two and has 110 cubic feet of cargo space. A 24-horsepower rear engine gives it a speed of 45 m.p.h. Bassons Industries, Bronx 60, NYC, molded the body.

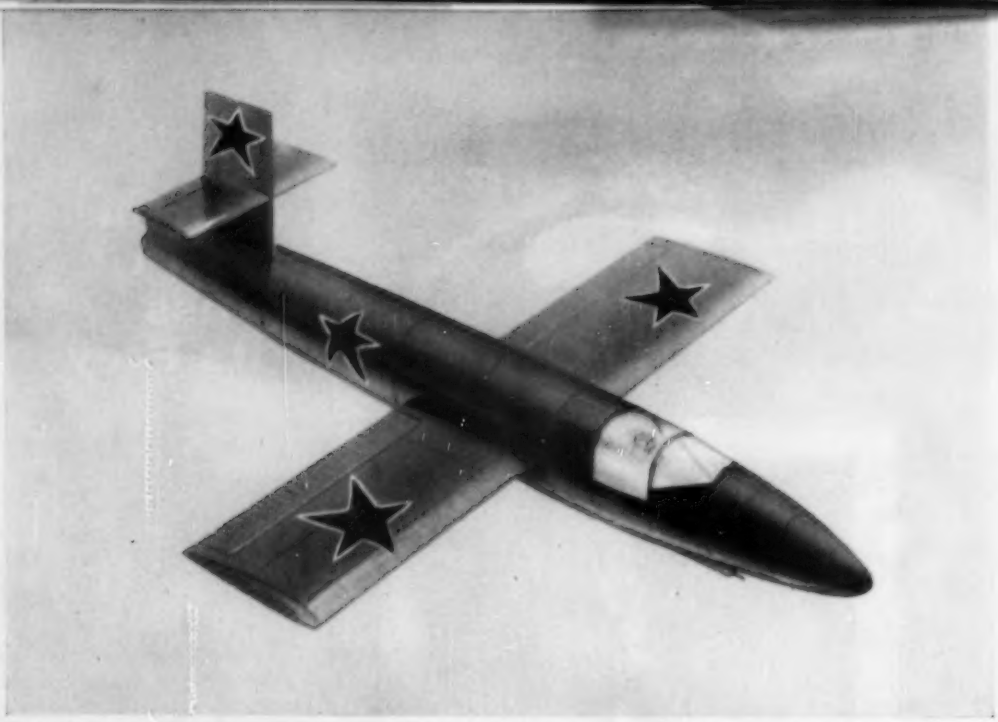
Falcon Can't Miss Its Prey

DEATH TO BOMBERS, new Falcon tails a drone B-17 (right) and pounces for the kill (above).

ENEMY bombers will be sitting ducks for the deadly Falcon. Its electronic brain guides it to the target, relentlessly following any evasive maneuver. Soon to be arming many defense interceptors, the guided missile was developed by Hughes Aircraft.

The Air Force also revealed an intercontinental destroyer: Atlas, which could strike Russia from the U.S., speeding thousands of miles an hour on a power plant developing millions of horsepower.

SMALL MISSILE fits under fighter wing, fires itself automatically when target gets in radar range.



Strange Wing Shapes Mark Fast and Effective Jets

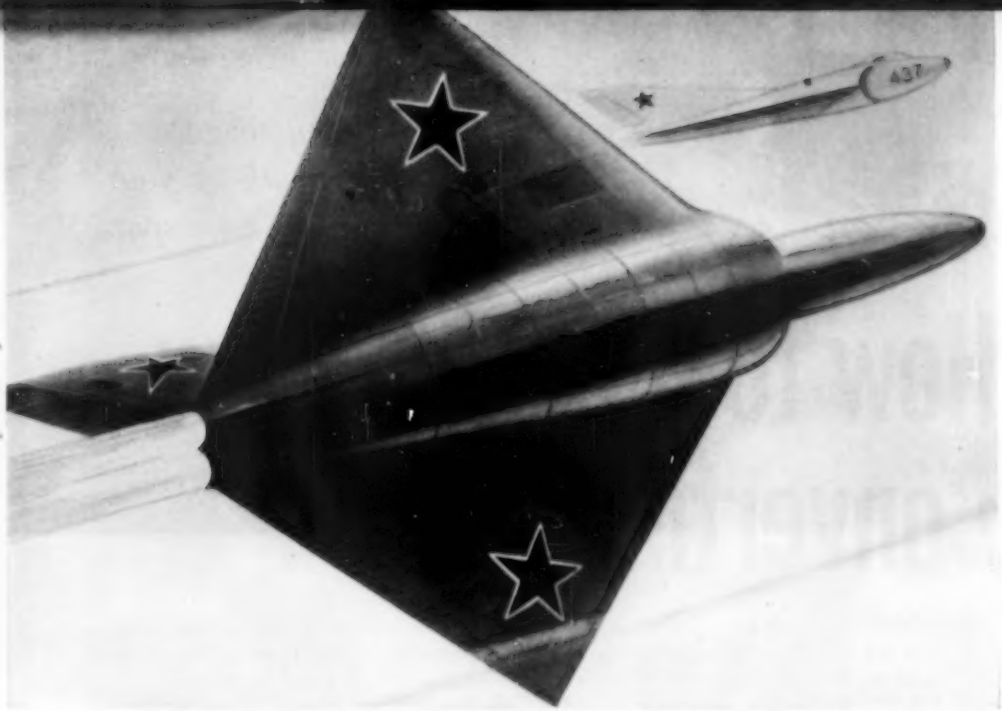
FACTS and pictures filtering through the Iron Curtain indicate that the Russians are trying strange new airplanes unlike any seen in the West. What two of the strangest may look like is shown in these sketches. According to the U.S. Air Force Association's

Bottles to Map Ocean Currents

WATCH for bobbing bottles at the shore this summer. About 12,000 hydrographic bottles are being set adrift off the Mexico-California coast. Return of the post cards in the Duraglas containers will help the Scripps Institution map ocean currents.

Model Previews Atom Tank

HERE is what an atomic-powered tank might look like. The U.S. Army has built its present conceptions into this wood model. Plans call for a 155-mm. cannon as chief weapon if and when a full-size baby rolls out of the Detroit Arsenal.



Reported Among Russian Air Force's New Fighters

unofficial publication, *Air Force*, the square-winged jet (left above) is a Yak-21 that can cruise at low speed to save fuel. The double delta, or flying rhomboid (above), is said to be able to stand on its tail after take-off for a 70-degree climb.

Radar Detects Meteor Dust

THIS odd radar antenna, nicknamed the "Spider," sits on a California hilltop and beams signals in six directions at invisible meteor dust. Stanford University scientists are charting the dust stream to study its effect on radio communication.

Army Gets "Machine-Gun" Hypo

FORMIDABLE as it looks, this "gun" hurts less than a hypodermic needle. Instead of piercing a vein, it shoots vaccine right through the skin. With it, Army doctors can give shots to 1,000 men at a time without stopping to refill it.

Try one of these wicked, gone gocarts. They're bound to put youth in your heart and a burn on your bald spot.

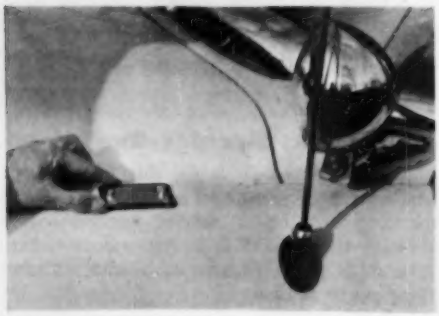
How to Buy That New Convertible

CHOOSING a convertible is a hateful job. It's like trying to make a choice between Marilyn Monroe and Gina Lollobrigida.

And it's complicated, often, by the necessity of justifying the purchase of *any* kind of a convertible to a wife who complains that she can't keep a set in her hair with the top down.

Backed into a corner, the average man is likely to resort to an iron defense like, "Humphrey Bogart owns one." Or, "This idea is bigger than either of us."

Fender-mounted grid, to close top automatically if it rains, is available on some cars



Well, why *does* he want a convertible?

They're expensive. They're noisy. They're drafty. Their trade-in value may be low. The top is always up when the weather turns salubrious. The top is always down when it starts to rain.

And practically everybody, at one time or another, dreams of owning one. Including, probably, you.

The appeal of the convertible is insidious, and the wardrobes that the stylists have given the 1955 crop are no help to the sales resistance of the man standing clammy-handed, rooted to the salesroom floor and staring transfixed at the job in fire-engine red with seats to match.

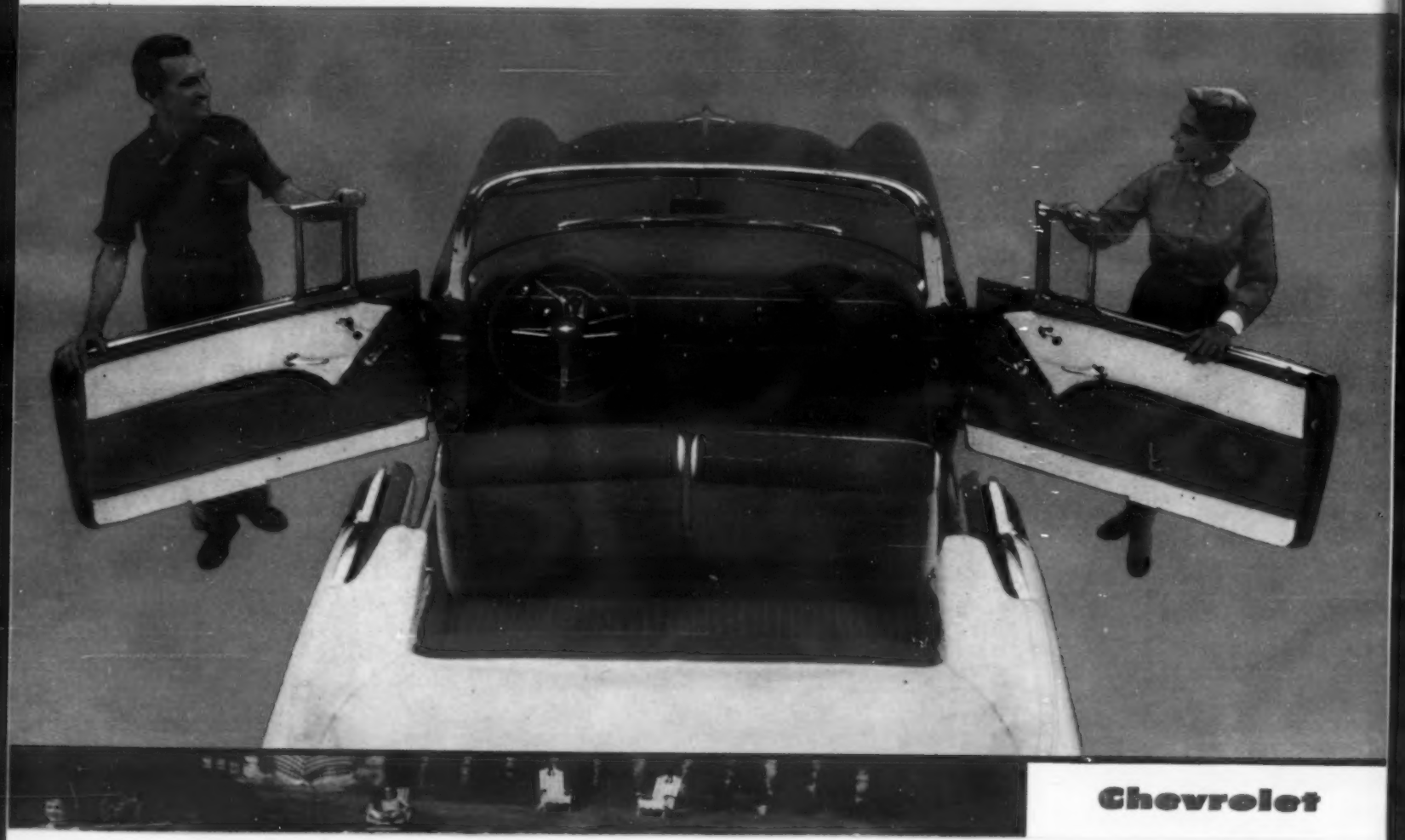
This year the exterior colors are straight from the gaudiest bands of the spectrum. Inside, the decorators take it from there.

Here are the color combinations offered by a single convertible maker:

Shoreline Beige and Gypsy Red
India Ivory and Coral
Glacier Blue and Skyline Blue
India Ivory and Regal Turquoise
Neptune Green and Sea Mist Green
Shoreline Beige and Autumn Bronze
India Ivory and Harvest Gold

If a man wins the initial bout with his

Fold out to see fanciest convertibles


Chevrolet

Packard *convertible, at 275 horsepower, is one of four super-dreamboats turned out by Detroit. Like the Cadillac, it is priced to include almost all the extras that Lincoln and Chrysler list separately*

Cadillac *Eldorado is about as inconspicuous as a four-alarm fire despite attempt at restraint (though not in huge fishtails, right). Its base price is the highest, too*

in red (above) is the perfect example of the convertible's appeal to boys of all ages—from 16 to 60

Ford

glamor—the moonlight and honeysuckle touch by a swimming pool—is strictly intentional

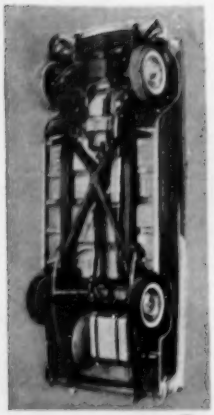
What Those Extras Cost	BUICK SPECIAL	CADILLAC ELDORADO	CHEVROLET V-8	CHRYSLER NEW YORKER DE LUXE	FORD V-8	LINCOLN	PACKARD CARIBBEAN	PLYMOUTH BELVEDERE
Base price of car	$2555.	$6286.	$2305.	$3585.	$2327.	$3727.c	$5892.a	$2326.
Air conditioning	—	—	—	—	435.	—	—	—
Automatic transmission	192.50	S	178.35	S	165.	S	S	178.30
Automatic headlight dimmers	—	48.20	44.25	—	—	E	—	—
Back-up lights	F	S	5.85	S	7.85	S	S	8.10
Curb buffers	—	D	—	—	—	24.	D	—
Custom steering wheel	15.10	D	—	G	18.95	—	—	6.50
Door guards	3.95	—	6.90	—	2.95	2.75	D	—
Electric clock	H	S	S	S	13.60	S	S	17.25
Electric windshield wipers	—	S	10.50	S	—	S	S	5.40
Engine power package	—	S	59.20	—	35.	—	—	31.60
Exhaust-pipe deflector	1.95	D	D	G	2.95	S	D	—
Fender skirts	—	S	—	—	17.	S	30.50	—
Fog lamps	—	S	—	D	15.50b	34.50	D	—
Glove-box light	S	S	S	S	1.75	S	S	S
Hand-brake flasher	F	S	4.25	S	3.95	S	D	—
Heater	81.70	S	72.80	76.20	66.44	112.50	S	48.50
Heavy-duty generator, voltage regulator	—	S	—	29.75	20.70	—	S	12.40
License-plate frame	H	S	3.25	S	—	5.	D	—
Luggage-compartment light	H	S	1.95	S	1.25	S	D	S
Oil-bath cleaner	S	—	8.80	S	S	S	S	S
Oil filter	S	S	11.85	S	8.51	S	S	S
Outside rear-view mirror	S	S	6.95	G	3.95d	D	D	4.05
Outside-mounted spare wheel	—	D	123.	—	134.50j	D	S	—
Power brakes	38.70	S	37.70	S	33.50j	40.	S	37.70
Power seat	69.90k	S	I	65.l	60.	65.	S	45.20
Power steering	107.50	S	91.50	105.	85.	120.	S	96.90
Power windows	96.80k	S	I	95.	95.	100.	S	102.30
Radio	92.50	—	62.	92.80	92.50	121.60m	S	89.70
Radio, signal-seeking	122.60	S	105.	123.80	—	—	—	—
Rain-triggered top	—	D	34.	—	35.o	—	—	—
Tinted glass	32.30	45.55	32.30	30.	21.43m	27.50	32.30	30.20
Turn indicators	S	S	S	S	14.16	S	S	16.20
Two-tone body	23.70	—	28.85	S	25.	—	S	S
Wheel covers	H	—	S	S	13.60	S	S	14.
Whitewall tires	28.60	S	26.90	33.10	28.67	35.20	S	26.65
Windshield washer	F	S	7.50n	G	8.89	10.50	S	10.80
Wire wheels	317.20	S N	—	215.	39.95	—	460.50	53.90
TOTALS	$3687.40	$6379.75	$3351.95	$4380.85	$3834.55	$4425.55	$6415.30	$3161.65

Unless otherwise noted, price quoted is factory-suggested list, including Federal tax but not including freight, sales taxes, licensing or dealer charges. Price covers car without accessories or extras except where they are standard equipment. With Ford and Chevrolet, accessory prices quoted do not include installation charges. Dash (—) means not available. **A.** *Federal tax not included in accessory prices;* **B.** *Torsion-bar suspension is standard equipment on this model;* **C.** *Does not include Federal tax;* **D.** *Installed by dealer;* **E.** *Available presently;* **F.** *Sold as part of four-item accessory group (includes glareproof mirror) costing $32.30;* **G.** *Sold as part of four-item accessory group costing $23;* **H.** *Sold as part of four-item accessory group costing $37.50;* **I.** *Price, $145.30, includes power seat and power windows;* **J.** *Two-way seat, $42;* **K.** *Four-way power-window price includes 2-way power seat;* **L.** *With rear-seat speaker, vacuum antenna;* **M.** *Windshield only;* **N.** *Saber-spoke wheels;* **S.** *Standard equipment*

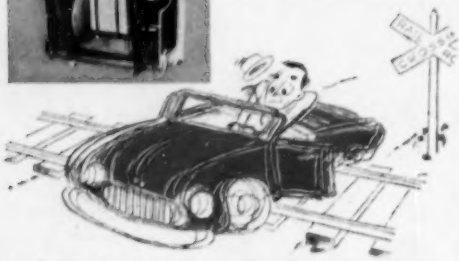
wife, he can dally for weeks among the wares of the convertible manufacturers. There are all kinds of things he—or you—can investigate.

How are the weather seals between the top and the windows? Between the top and the windshield? Convertibles are better all-weather cars than they used to be. They offer more protection against rain, snow and low temperatures. If a convertible can't splash through a hard rainstorm without getting dribbles of water on the inside, it's behind the times.

How positive is the mechanism that raises and lowers the top? At one time this was all-electric. Now the best of them wed an electric motor to a hydraulic accumulator that adds muscle to the chromed scissor levers. When the con-



Absence of a stiffening steel top on convertibles necessitates the addition of an X member in frame, like that in car standing on its tail. It helps on railroad tracks



trol on the panel is turned, the response should be instantaneous and, above all, smooth.

The top material should be vinyl, or even Orlon, generously backed with a close-woven cotton fabric. The time was when tops, of cotton, would begin rotting and fraying within a year despite loving care.

The traditional mark of the convertible used to be its shudder in crossing railroad tracks. Its convolutions were those of an Airedale shedding water. But things have changed. Get down on your hands and knees and take a look at the heftiness of the X member that braces the frame. Better yet, *drive* the car over a bumpy crossing.

Most of the new bodies are stronger in other ways, too. But see for yourself. Does the seductive wire-wheel job in orange-yellow have stiffening members across the firewall, immediately behind the engine?

Passenger capacity? That rear seat, squeezed between the front seat and the well for the top, used to be sized for only the small fry. Now the leg room ought to be enough for adults. But don't accept the salesman's bland statement that the convertible is a six-passenger vehicle. It will hold no more than five nicely unless it's one of those monsters with a price tag like a yacht.

That rear plastic window ought to bear a fair resemblance in size to the rear window of a sedan. If it's small, beware. The wrap-around fabric in a convertible makes it blinder than cars with hard tops, and today's traffic requires visibility. Don't forget to order an outside mirror. Ripples in the plastic window distort the view in the inside mirror.

Power is no mere added luxury in a convertible. What's the horsepower? The torque? Convertibles are heavy. They scale from 100 to 200 pounds more than a comparable sedan. That's mostly due to the beefing-up in the body. A few dollars more, in many cases, will buy a power package to insure performance.

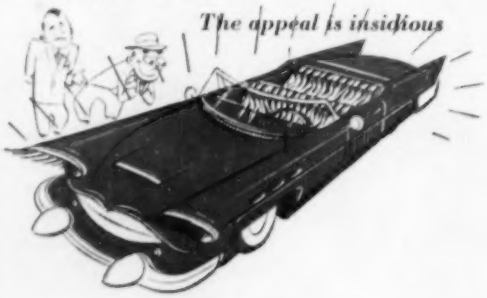
Finally, while convertibles are relatively expensive, the price need not be sky-high. The car exhibited in the salesroom may be tagged at $3,000 or more, freight and handling excluded. But what extra equipment has been loaded on it?

Its base price, without the frills and furbelows of an automatic transmission, power steering, power brakes, rain-sensitive machinery to lower the top automatically and leopard-skin upholstery, probably is around $2,200. That's only $250 more than the base price on a sedan.

The buyer, love-struck on a convertible, seldom gets away that cheaply, though. When he walks into a salesroom, the man is likely to say, "Well, I've got a dreamboat here, with a soft hat, white shoes, music and all the jewelry."

Take one look, brother, and you're lost. —*Devon Francis.*

The appeal is insidious



"Armored" Jeep Rakes In Balls On Golf Range

THE golf-ball retriever riding the front of this jeep clears a Miami driving range in a hurry. Caught between wheels, the balls are lifted and popped into the flat baskets attached to the front of the apparatus.

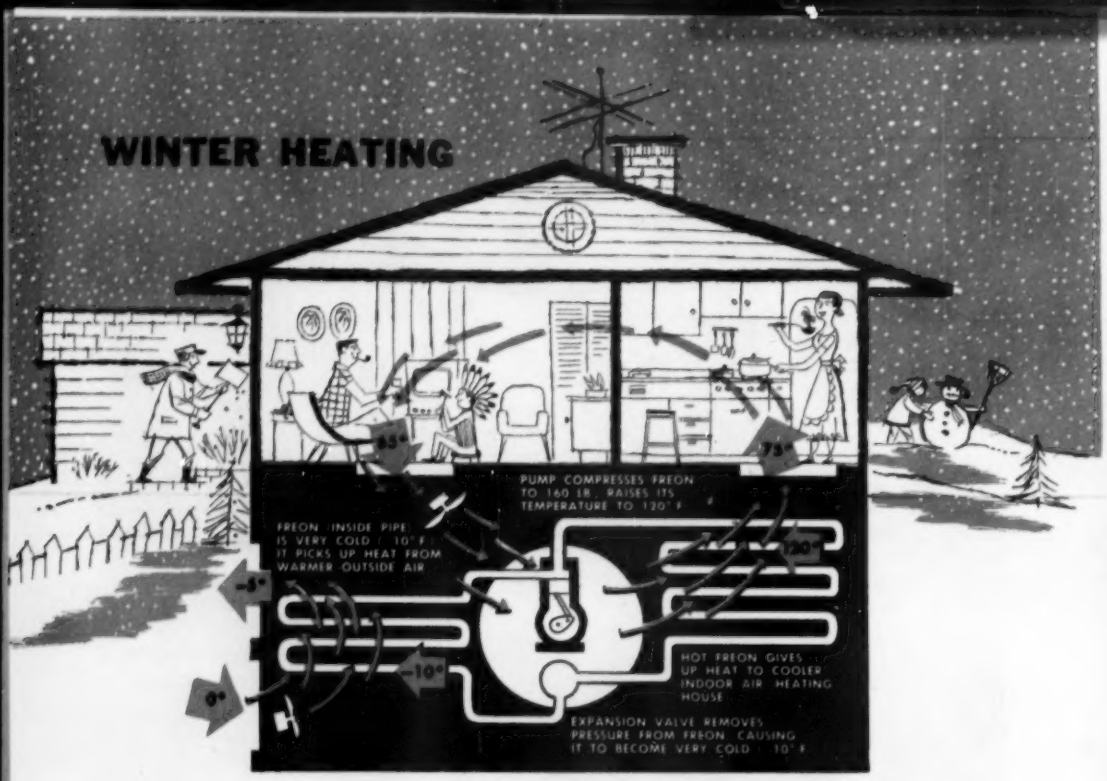
Netting enclosing the jeep protects the driver against flying balls as he rides the range.

Uranium "Gun" Hunts for Radioactive Rock

THE hunter at left is aiming at uranium—he hopes. Inside his "gun" there's a high-intensity counter tube and an amplifier. The instrument weighs less than two pounds and gets its power from a flashlight battery. Curtiss-Wright Corp., Wood-Ridge, N.J., designed the Radiatector for contamination surveys and lab analyses as well as for prospecting.

Plastic Cruiser Has Plastic Chairs, Too

HERE's a sea-going "hardtop." It is all plastic—even the chairs are molded as part of the hull. The outboard cruiser has 18 flotation chambers to add buoyancy and rigidity. The deep rear cockpit keeps out backwash and the outboard-motor well is self-bailing. Car polish keeps the plastic shining and barnacles get no foothold—they can be brushed off the surface. U.S. Fiber Glass Products, Inc., Costa Mesa, Calif., makes the boat.



Now You Can Pump

Home unit takes warmth from the air and puts it inside in the winter, outside in summer.

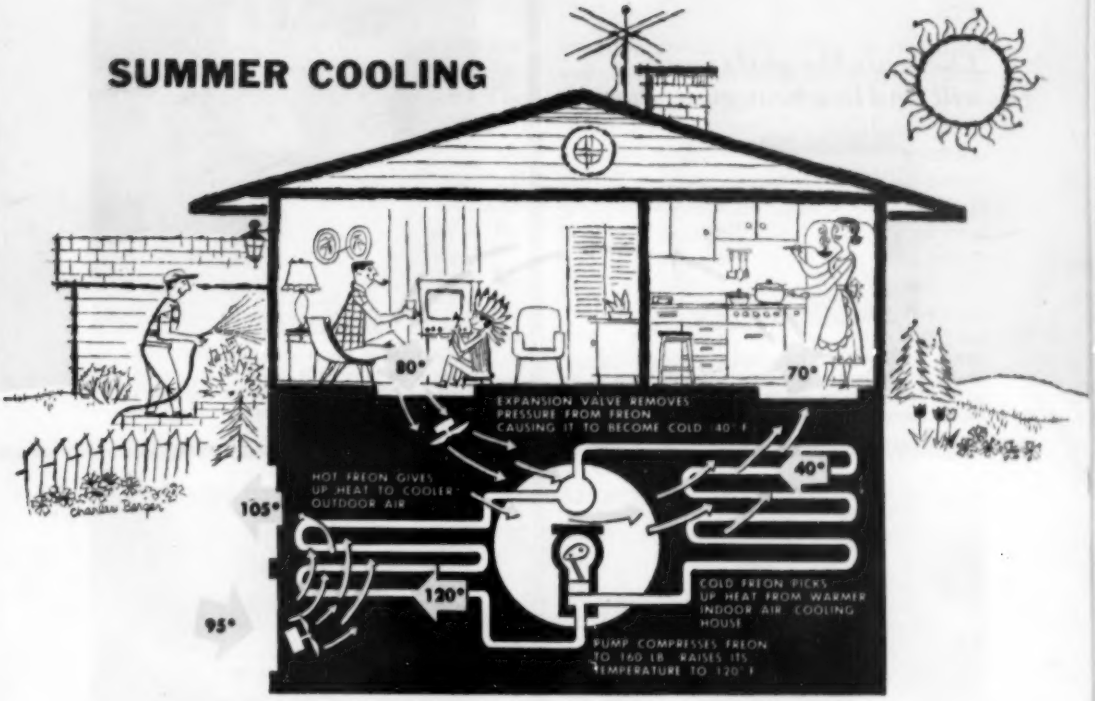
By Herbert O. Johansen

THE bugs have been engineered out of home heat pumps. Within 10 years, heat-pump manufacturers predict, more than a million U. S. homes will have automatic, year-round electric air-conditioning systems that use air as "fuel."

General Electric and Westinghouse are putting out packaged units now. They cost only a little more than good conventional heating and cooling systems. In most parts of the country, the electricity required to operate one of these systems is comparable to the cost of fuel oil, gas or coal. Manufacturers are working on low-cost heat pumps. And if atomic energy reduces the cost of generating electricity, you may find heat pumps in low-priced homes as well as expensive ones.

Then, predicts William G. Cox, GE air-conditioning expert, heat pumps will supply hot water and running ice water, handle all food refrigeration, take care of low-temperature cooking (up to 212°), and store heat for use when needed.

Houses without chimneys will be commonplace, since a heat pump requires no furnace outlet. All windows can be permanently sealed, since the machines circulate plenty of fresh air. Dusting will be practically eliminated. A heat pump creates no dirt of its own, and with a glass-fiber filter in the indoor air intake, it serves as a central vacuum cleaner. You'll feel no humidity, even on the muggiest days.



the Heat In or Out

How do heat pumps work? Charlie Berger, the artist who made the drawings above, had never heard of a heat pump until I started explaining.

"You mean," he asked, "that even if it is zero outside you get heat out of that freezing-cold air and pump it inside to warm your house?"

"That's what an air-source heat pump does," I said.

He looked at some rough sketches. "And according to these, in the summer the thing reverses itself and cools your house by picking up heat from the inside air and pumping it outside, even on the hottest day?"

"Right again," I said. "The heat pump picks up heat from the air and puts it where you want it, outside in the summer for cooling, inside in the winter for heating."

He didn't look convinced.

"Of course," I said, "some heat pumps —more complicated to install—get their heat out of the ground and others out of water."

"And I suppose," he said, "that they take heat from the house and put it into the ground or water for summer cooling." When I nodded, he almost walked out.

"Wait a minute, Charlie," I said. "It's really very simple. You have a heat pump in your house now."

"I have?" he asked.

"***Your electric refrigerator*** is a heat pump. It keeps food cool by taking heat out of it. That heat is transferred to an outside coil at the back. When the refrigerator is working, you'll find that the coil is quite warm."

He nodded agreement.

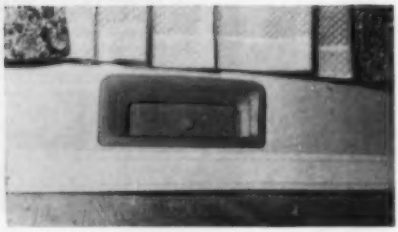
"Now," I went on, "let's suppose you put your refrigerator in a wall with its

These are the parts you will find in a heat-pump home

WALL THERMOSTAT has dual controls—heat and cool. If house becomes warmer than a preset temperature on the cool control, machine automatically goes to cooling.

LOCATION of the heat-pump unit is not important so long as it has easy access to outdoor air. Here is a basement installation of the new GE Weathertron.

OUTSIDE AIR enters left louvered opening, is blown out through the other. Passing over Freon-filled coils, air gives up warmth for heating, removes it for cooling.



ROOM REGISTERS blow warm in winter, cool in summer. So gentle is the air flow that, when this photo was taken with the pump in operation, curtain hardly stirred.

door open outside and its coil facing inside. Instead of taking heat out of food, it will take heat out of the outside air and transfer it to the coil inside the house. It has taken heat from outdoor air and put it indoors."

"I get it," said Charlie. "If I then turned the refrigerator around with the door inside, it would take heat from my house and put it in the coil outdoors."

"That, in principle," I said, "is an air-source heat pump."

As you can see in Charlie Berger's drawings, a heat pump's machinery has an indoor coil, an outdoor coil, with fans for each, and a compressor. For heating, this is what happens on a zero day:

Freon 22 refrigerant (used in the newly announced GE Weathertron heat pump) is pumped into the outdoor coil where it is cooled down to minus 10°—10 degrees colder than the outdoor zero air. Since heat tends to flow from a higher temperature to a lower temperature, the Freon picks up some outdoor heat—in this case, five degrees—as it is blown over the coil.

The Freon is then compressed, in the process reaching a temperature of about 120°. This warm Freon is pumped through the indoor coil. Cooler air, sucked from the house, passes over this coil, is warmed, and blown back into the house. The Freon continues its circuit, getting cold again when the pressure is removed in an expansion valve, and is ready to pick up more heat as it goes through the outdoor coil again.

For summer cooling, the cycle is reversed. (Although Charlie Berger's schematic drawings show the compressor and expansion valve on physically different locations for heating and cooling, the summer reversal is accomplished automatically by transfer valves.)

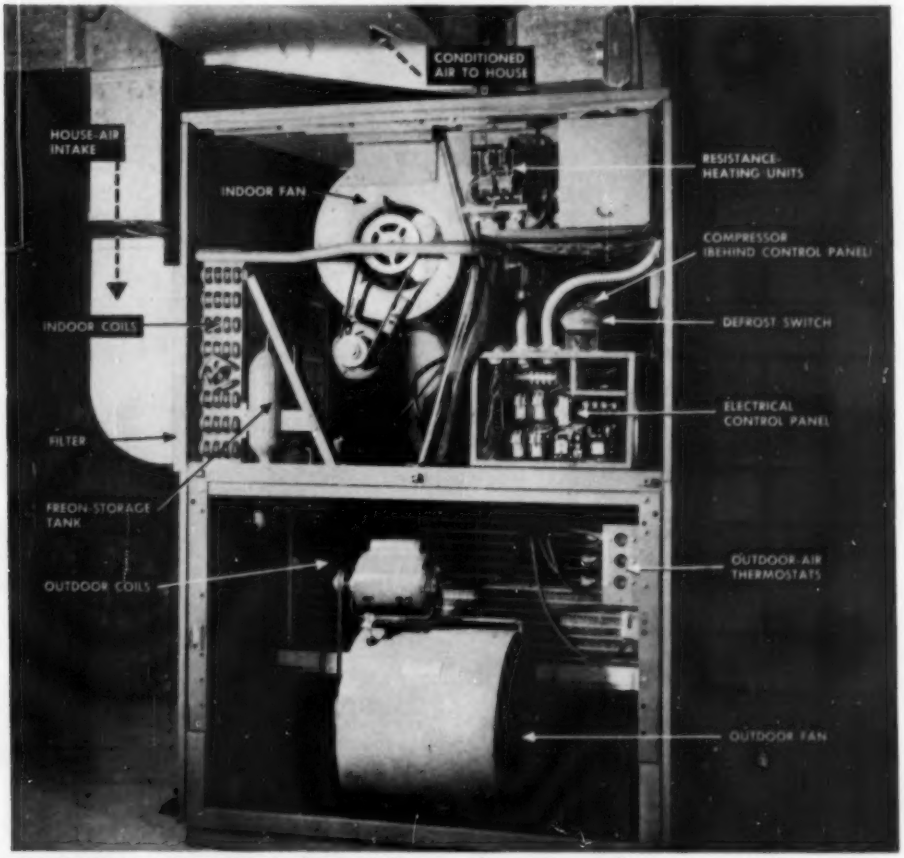
Cooled Freon passing through the in-

door coil picks up heat from the warm house air that is drawn over it. This cool air is blown back into the house. The Freon in the coil, now warmer, goes to the compressor, where, under pressure, its temperature is raised. When it is pumped to the outdoor coil, it is warmer than the outside air, getting rid of the heat it picked up in the house.

Air-source heat pumps on the market today have ample cooling capacities, but the colder it gets outdoors, the more difficult it is for them to extract heat from the air. Below certain temperatures, the machine needs help. This is furnished automatically by supplementary electric resistance heating units.

For good reason, the resistance units are used only for short on-and-off periods during really cold weather: With resistance heat, electricity is burned directly to give heat, delivering one unit of heat for one unit of electricity. The heat pump does not burn electricity directly but uses it to operate a machine that extracts heat from the air. It gives out about three units of heat for one of electricity. END

Inside the heat pump—a machine that makes weather



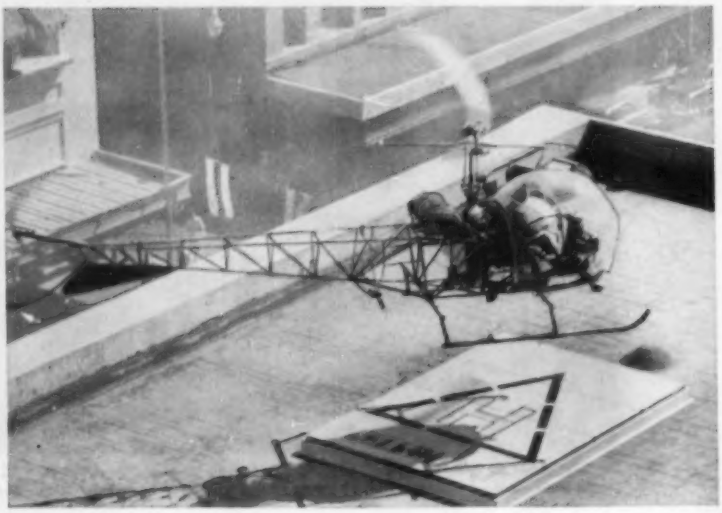
WEATHERTRON HEAT PUMP is designed for a small (six-room) house. Cost of installing complete system will run from $2,600 to $3,500. A larger size for bigger homes is available.

A rescue scoop that dips up ditched airmen like fish in a net is being tried out by the British. A tubular frame keeps the scoop open as the copter trails it through the water. Cords fixed to the hauling line close the net over its catch. Injured men can be rescued with greater safety than by the older sling method.

▶▶▶Ever see a copter spin in and land without a pilot? Kaman Aircraft has designed a remote-control job for the Navy. Test flights so far have been within eye range of the ground operator and there's been a pilot aboard the "drone" copter to take over the controls in case of emergency.

Helicopters Show Off New Tricks

There's no splash when this copter lands on its rooftop heliport, but it sits down on water just the same. The rigid platform floats on a liquid cushion that distributes the weight of the copter evenly over the roof by hydrostatic pressure. The water also acts as a fireproof shield and a noise barrier for the building. Interlocking panels that form the float weigh only five pounds a square foot, but each square foot can support 6,000 times its own weight. The Thomson Research Co., Mesa, Ariz., makes the Heli-Float.



Tail up, this lashed-down sub hunter is going through its paces to prove its worth as a "tug." The Navy will say only that the helicopter is being tested as a "tow craft for armament." The specially designed tilting platform sets up the copter for attitude tests so that Bell engineers can record flight data on the ground.

Look, no wheels. Maybe that's why this Army XH-39 has copped two copter records. With its landing gear tucked up and its 400-hp. gas-turbine engine going full blast, it has churned through clouds at 156 miles an hour and bored a hole through the sky 24,500 feet up. The 2,200-pound Sikorsky's large cabin with 81-cubic-foot capacity can carry three passengers and 100 pounds of baggage, two litter patients and a medic, or 800 pounds of cargo.

That Wonderful Machine on Your Wrist

By George Kent

Swiss watch is a 1/100,000-hp. engine—put together by hand with tools that can split a hair.

NEVER underestimate that watch on your wrist! It runs on 1/100,000 of a horsepower, yet think of the work it performs. Its balance wheel makes five forward jerks and five stops every second—864,000 moves a day at a speed of about 60 miles per hour. And the punishment it can absorb! A friend of mine once left a watch in a shirt pocket, and it wound up in a washing machine. Whirled and beaten and battered for an hour in hot, soapy water, it came out to tell the time accurately.

The people of one small nation know better than any other how to make these remarkable instruments: Switzerland today produces 60 percent of the world's timepieces, and, in doing so, achieves a minor economic miracle. (A pound of Swedish steel unloaded in Geneva costs $5. By the time Swiss watchmakers have finished turning it into hairsprings, the same pound of steel is worth $5,000.)

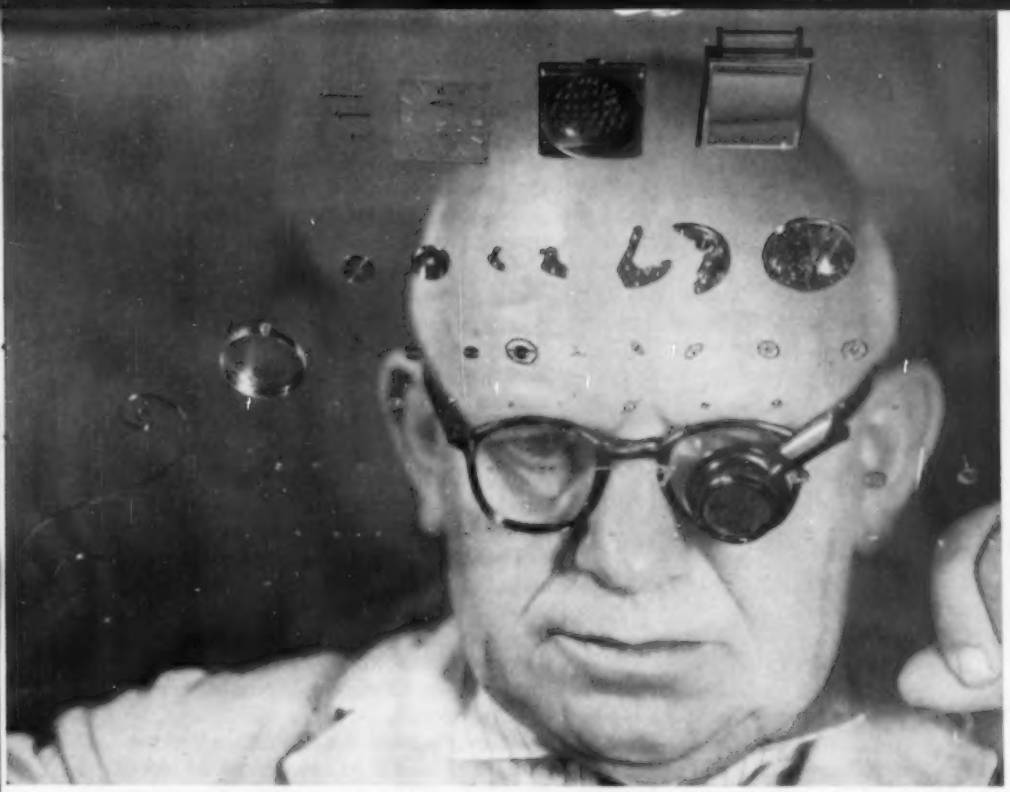
The watch industry got its true start as a Swiss industry some 300 years ago when an Englishman—so the story goes—took a ride through the Jura Mountains. There, in the Swiss village of LaSagne, his watch stopped. Rather than carry the useless thing around with him, he asked a blacksmith named Daniel Jeanrichard to repair it.

A big man in a leather apron, Jeanrichard confessed that he had never seen a watch before, but he would try to fix it. Like all of the Jura people, he was handy: not only did he fix the watch, but later he made another for himself, from memory.

It wasn't long before neighbors—farmers, shepherds, locksmiths, carpenters—saw Jeanrichard's watch and learned how to make a watch themselves. Then men in other villages followed suit, until the craft spread up and down the mountains. This was a pleasant, absorbing trade, exactly what these people needed to while away the tedium of six-month-long winters. It was their patience and skill, combined with the bril-

IN HOROLOGICAL SCHOOL a giant model is used to explain movement of jeweled-lever watch.

STUDENT regulates hairspring so balance wheel will oscillate exactly 18,000 times an hour.



Swiss watchmaker examines 120 parts for a man's wristwatch spread out on glass table top.

liant improvements and inventions of the Geneva artisans that concentrated watchmaking in Switzerland.

Today Switzerland exports approximately 33,000,000 watches and movements per year. Most of them are turned out in the 2,500-odd shops and factories which employ some 70,000 men and women. A small number, however, are still made in the old-fashioned way in farmhouse living rooms by men who manufacture everything they use, from balance wheel to second hand.

There is no assembly line, as we know it, in a Swiss watch factory. There is very little noise. Here and there are mountain-sized machines that labor to bring forth mouse-small parts, achieving tolerances of 1/20 the thickness of tissue paper. One jig borer can split a hair into 50 equal parts.

For all this mechanization, 60 percent of watchmaking is hand labor. Out of the 1,400 operations that go into making a timepiece, 1,000 are done by craftsmen who work under conditions that would give a normally nervous man the jumping jeebies.

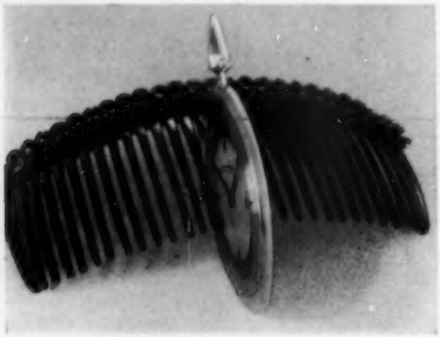
Talking is taboo, not only because it distracts but because vapor issuing from the mouth can have a corrosive effect on a watch's parts. A sneeze is a near-crisis, and a yawn at the wrong moment may seriously impair accuracy.

Perspiration is also dreaded, and the chronic sweater either quits watchmaking or keeps drying his hands. Smoking is forbidden. Women may not wear perfume. Every worker, when he enters, sheds shoes and dons slippers and smocks, to protect the movements from the dust of street clothes.

For the dainty and painfully precise job of attaching the hairspring, women are universally employed; men are, as a rule, too heavy-handed. A crook of so much as a millimeter in this delicate gadget, the merest overstretching, and

your watch is off by minutes. Men are experts in other departments, however, including the handling of pepper-speck-size screws—so small that 50,000 of them will fit into a thimble!

That craftsmen in so precise a profession as this should be well rewarded seems only right. In an earlier day the Swiss watchmaker earned twice as much



Thinnest watch fits between teeth of a comb.

as any other journeyman, and in that day he was the only journeyman permitted to carry a sword. Today he earns 20 percent more than any other Swiss artisan, and is among the highest paid in Europe.

Why are the Swiss so skilled in making watches? The inheritance of patience and a passion for exactitude are factors in the development of such skill, but most Swiss believe that chief credit should go to the schools.

There are seven horological schools in Switzerland which are, in fact, topnotch schools of all-round technology. The shortest course is 15 months—for certain *régleuses*, the girls who attach the hairsprings. The longest is seven years—for a master watchmaker. Employers are lined up waiting for them as they graduate. There is little unemployment in this industry and there has been no serious strike for 16 years.

The applicant for admission to a watchmaking school submits himself to a set of aptitude tests. In the first, he is given a plate covered with small holes which range in diameter from a hairbreadth to 1/16 of an inch. With this, he is handed a pair of tweezers and a box of screws. He is required to pick from the box the screws that will fit, and then screw them into position. His errors are noted, and as he works, he is timed.

In a second test—also aimed at assessing an applicant's judgment of size, depth and distance—he is shown a pair of calipers several feet away. Task: to set the pair he holds in his hands to correspond with the remote pair.

In another he is given a length of wire and a pair of pliers, with instructions to bend the wire to match a geometrical figure drawn on a sheet of paper.

There are at least a dozen such tests, and they differ little from school to school. At the end of the first semester they are repeated. If a student has not improved in his ability to do them, and if there are no extenuating circumstances, he is dropped.

Once admitted to a school, the student's first task is to cut a block of wood down to millimeter-precise dimensions. Then he is given a watchmaker's diminutive lathe, which will be his to clean and care for as long as he remains in school. In time he makes his own tools. A watchmaker has more dies, gauges, stamps, awls, screwdrivers and punches than a surgeon has knives. No craftsman worth

Braille watch, for the blind, has raised points.

his salt has any less than $250 worth.

During his course, each student makes every part of four chronometers. A chronometer has 300 parts, as compared with the 150 of an ordinary watch.

In their classroom work students are taught geometry and trigonometry, languages, drawing, astronomy and metallurgy. They are lectured on the theory and history of timekeeping and, with the aid of films and a huge model watch with a winding knob as big as a cabbage, learn what goes on behind every tick.

Out of Switzerland have come most of the modern advances in watchmaking. The Swiss were the first to put jewels (as bearings) in watches, the first to make a foolproof escapement, the first to combine nickel and steel in the modern hairspring, the first to make watches that were waterproof and self-winding.

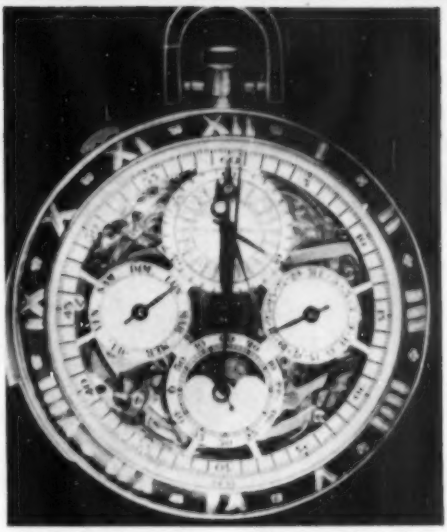
It takes only a few seconds to wind a watch, yet for 200 years men have been trying to produce a satisfactory self-winder. One man decided that the best scheme would be to use the wind. So he worked out a drive shaft that connected his timepiece with a weather vane on the roof. It worked, but you couldn't take it with you.

Change in air pressure, caused by opening and shutting doors, was another fellow's idea—and it also worked. The trouble was that on a quiet evening at home, with no one coming in and out, the watch would run down.

Another inventor tried using temperature changes. He put a thermometer inside his watch, and when the mercury rose by as little as two degrees it forced up a bar that kept the instrument going.

One of the best self-winders—and a promise for the future—is a clock now in operation in Neuchatel. A photoelectric cell converts light into electricity and provides propulsion through a quartz crystal.

For popular use over recent decades, however, the Swiss have been leaning on a device invented by Abraham-Louis Perrelet about 200 years ago—a weight inside the watch which swings on a pivot whenever its owner moves. In effect an internal pendulum, this is the principle of most present-day automatic watches.



Complex chronometer tells time, day, date.

An ordinary watch with a single movement is remarkably complex to produce. When you add wheels within wheels, pack movement upon movement, so that a watch will perform certain extracurricular jobs, the production process becomes almost incredible. Here the extraordinary skill of the Swiss comes into play. Into a single case they have packed as many as nine movements, each one designed to perform a specific recording job, and all have worked together in perfect harmony.

The Swiss have made watches for recording distances, for taking the pulse, for counting breaths. They have made slide-rule watches, production counters and telephone timers that let you know when your three or five minutes are up. They have worked out special watches for parachute drops, for underwater swimmers, for mountain climbers and tide-tellers. They have produced watches with concentric dials that give you solar time, lunar time and the time anywhere in the world. For the last Olympic Games they developed a camera watch that not only recorded photo-

[*Continued on page 272*]

Jackknife Car Gives Cushioned Ride

Rough roads are made smooth by hydropneumatic suspension available in a current Citroen.

REAR wheels trail on pivoted arms behind the chassis to smooth the ride of a new French car—a special extra-price model of the five-passenger Citroen "15" introducing hydropneumatic suspension.

Through downward extensions of the wheel arms, the car's weight is supported at the rear by a pair of pistons, in cylinders containing oil under pressure.

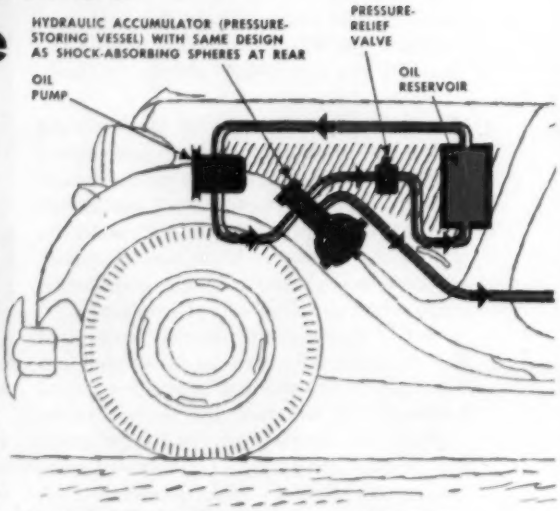
When a rear wheel rides over a bump, its arm rocks and actuates its piston. Through a small orifice, oil flows between the cylinder and a metal sphere, in which inert gas cushions the shock.

Joined by a flexible torsion bar, the arms swing independently. Front-wheel drive enables rear wheels to idle.

Under the hood, an engine-driven pump feeds oil from a reservoir to a hydraulic accumulator (a pressure-storing vessel) and thence at automatically regulated pressure to the pair of cylinders.

If wheel arms swing a little farther than in normal action, rubber cones on their extensions bear against bumper plates on the chassis. This limits settling or rise of the rear of the car from deficient or excess oil pressure. With engine stopped the car settles to the cone-and-bumper stops, observers say, despite a dashboard valve intended to seal pressure; but running the engine again for a few seconds restores pressure and readies the car for the road.

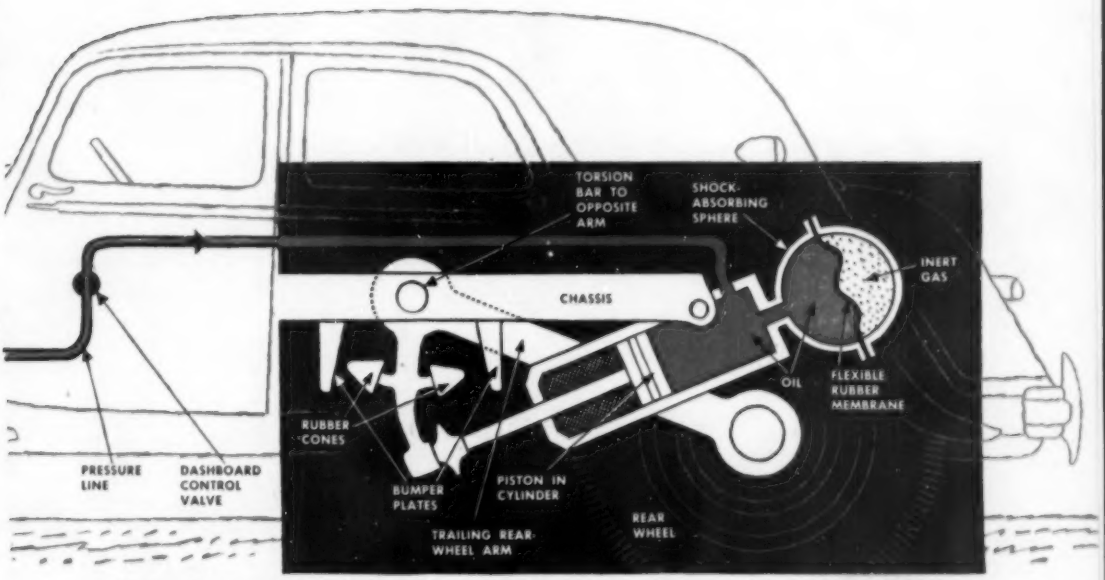
In response to a control valve in the trunk, the car frame jackknifes, then lifts a rear wheel from the ground—a handy aid in changing a back tire.



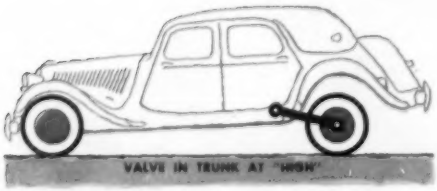
TO SUPPORT REAR WHEELS on trailing arms, new hydropneumatic suspension applies oil pressure from engine-driven pump as shown.

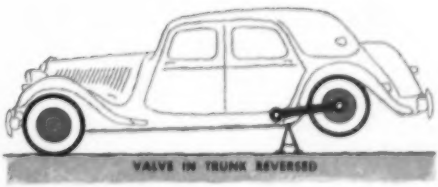
This Swimmer's a Frogman on Ice

"COME on in, the water's freezing," this Navy underwater demolition man may be calling to teammates from the USS *Burton Island*. Their chilly job was to test the effectiveness of explosives and special gear (here, an underwater camera) during an Arctic spring cruise.



Gas in spheres cushions shocks. Even on rough road, ride is said to be so smooth that you can read, write or fill a glass of water. Special six-cylinder Citroen "15" with this innovation is priced at about $2,685 (940,000 francs), approximately $200 more than regular model.

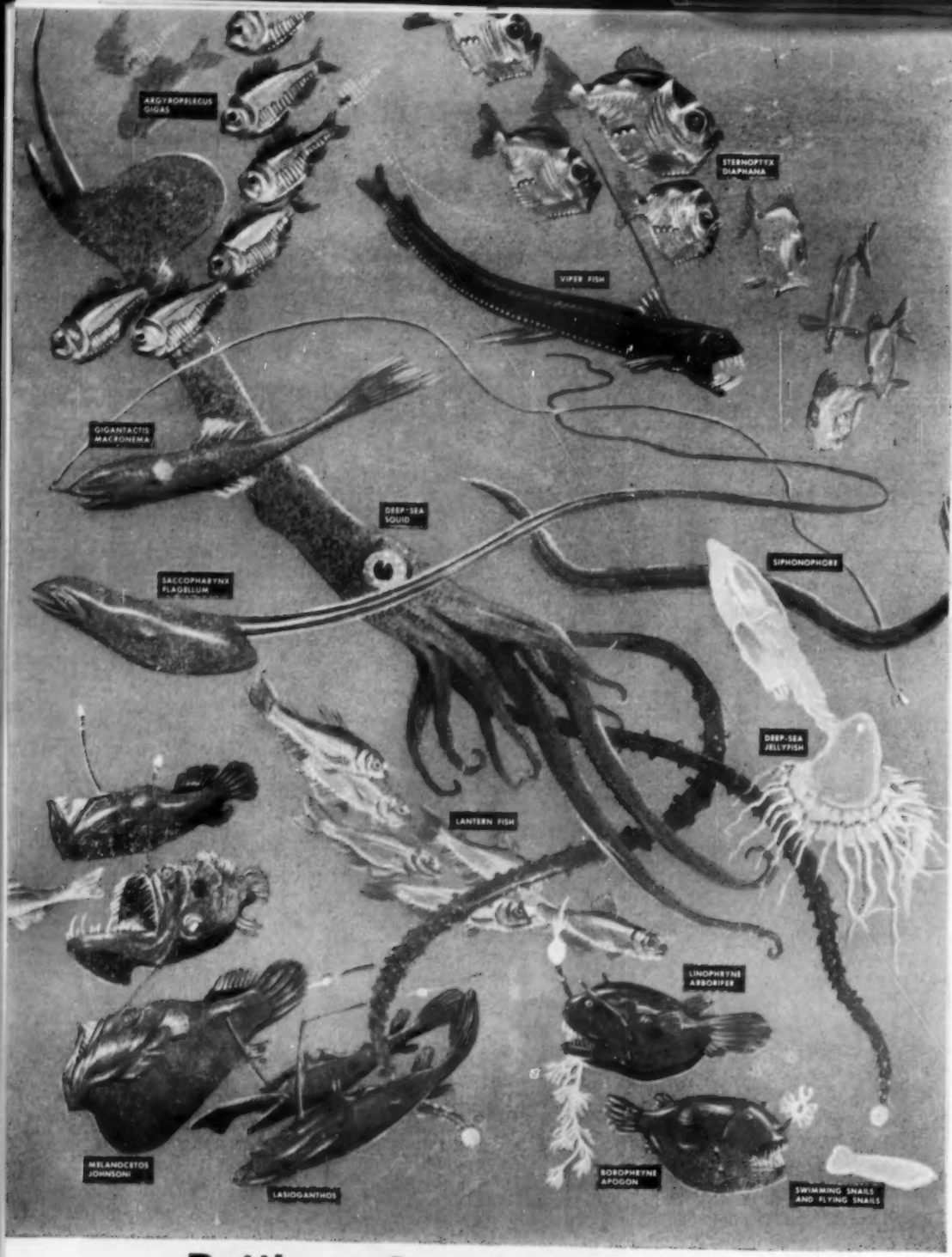




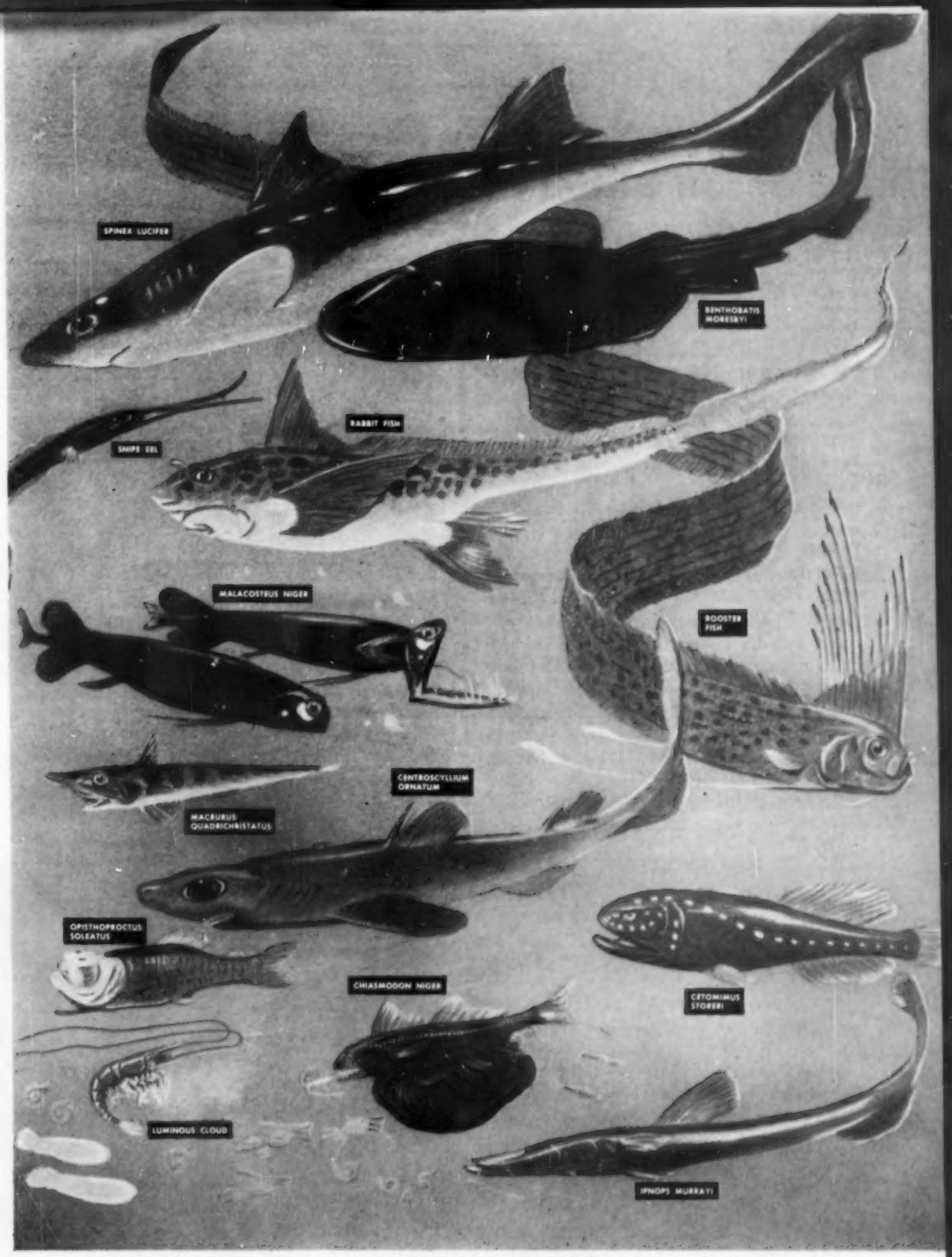
TO CHANGE REAR TIRE, you turn valve in trunk to "high" and hydraulic pressure depresses rear-wheel arms, raising body. An A-frame is placed to support the lifted body. With valve reversed, wheel arms return to near-horizontal position, raising the wheel from the ground on supported side. The same sequence lowers the wheel to the ground after tire change.

. . . This One's a Stand-In for Fish

MAKING like a fish, a mermaid shows off a nine-foot-long, 540-gallon tank for the Detroit Municipal Aquarium—"one of the largest free-standing all-glass tanks ever built," its maker, the Pittsburgh Plate Glass Co., says. Brass rods connect the sides and bottom of tank.



Putting a Searchlight on the Deep



STRANGE AND MENACING FORMS move through the inky black depths of the ocean. If man could reach these enormous depths, he'd see only points of light (white on the drawing) flashing around him. But a powerful searchlight would reveal these weird fish swimming by.

Please turn the page for more about deep-sea fish

Weird Fish Live on Ocean Bottom

LIKE creatures from another world, the fish that live in the great depths of the open sea resemble nothing you ever hooked in a country stream. Actually their home is another world, a strange place of tremendous pressures and eternal darkness. No man has ever been there.

Some of this grotesque deep-sea life, however, has been brought to the surface by nets and long lines, and scientists have deduced much about conditions miles down. The drawings on the preceding two pages, prepared by Neave Parker, a British artist, show many inhabitants of the ocean bottom.

Because of the blackness, most "abyssal" fish carry their own lights with them, usually in special luminous organs called photophores. Some, like *Melanocetos johnsoni* and *Linophryne arborifer,* have their lights on upright arms, like radio antennas with illuminated tips. (These names are the Latin scientific ones, since few deep-sea fish are caught often enough to acquire common names.) *Chiasmodon niger* and *Cetomimus storeri* have brilliant spots strung along their bodies, like lighted portholes on a ship. *Spinex lucifer,* a kind of shark, has tiny light organs grouped all over its body to create a uniform greenish glow.

Other types of deep-sea fish have no special light organs, but still glow, either because they carry luminous bacteria on their skins or because they secrete a luminous slime.

A few varieties carry no light at all. These usually have very tiny eyes or, like *Ipnops murrayi,* no eyes. The unlighted fish are often colorless or the color of coastal fish, while the lighted fish are generally black.

Bizarre teeth and jaws, special feelers and expanding stomachs also mark many of the strange fish. One of these creatures is *Chiasmodon niger,* which can swallow other fish bigger than itself.

Modern Lamplighter in a Dam

KARL WEDEWARD, above, has a full-time job keeping the lamps burning at Grand Coulee Dam. There are 13,000 lamp sockets in 8½ miles of tunnelways and three huge buildings. Traveling four or five miles an hour on a motorized cart, he changes about 250 bulbs a day.

Plastic Hothouse Folds Up

THIS collapsible greenhouse, shown at a German agricultural exhibit, goes up in minutes. A metal framework covered with plastic sheeting, it weighs only 80 pounds but provides 190 square feet of planting space. The hothouse is also made in larger and smaller sizes by Apparatebau Ziegler, Konigsweg 40-41, Berlin-Zehlendorf, Germany.

CAR-ON-RAILS stops to get regular clearance form from towerman at Selkirk, N. Y., before proceeding east on main-line tracks.

Let's Go Driving On the Railroad

It looks crazy, but it's fun—and real handy if you're president of the N. Y. Central—to have an auto that rides on the tracks.

By Devon Francis

AT LEAST once each week since last fall, someone has telephoned the New York Central Railroad and said, "A crazy guy is driving a car along your right-of-way."

That's not the half of it. The guy not only is driving an automobile on the right-of-way, he's driving on the rails themselves, and at 60 miles an hour.

Every so often he wheels the car off the rails and goes highballing off cross-country on the highways as fast as the law will allow.

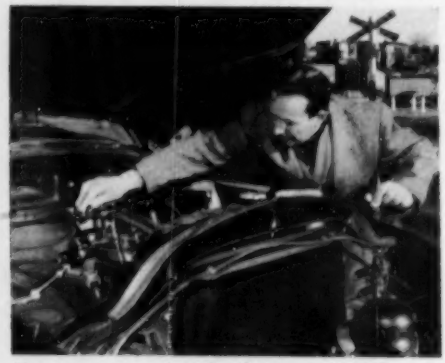
He's not crazy, though. He knows what he's doing.

He's driving a specially equipped seven-passenger sedan known unromantically as "100." It's the personal inspection automobile of Alfred E. Perlman, new president of the road. It rides the rails on four rubber tires plus four flanged, steel-shod wheels. The flanged wheels

Watching a fast freight bear down on you on an adjoining track can be unnerving at first.

First, it's backed onto rails at crossing.

It's aligned, so flanged wheels can drop.



Turning pressure valve lowers wheels . . .

. . . until they engage rails, fore and aft.

Car can be put on rails in two minutes, or taken off in one

go up, at the turn of a valve, for conversion to road travel.

It may be crazy, but it's a handy vehicle. It can be driven from the highway onto the rails, and from rails to highway, any place that there is a grade crossing. The tops of the rails must be flush with the road to effect the change-over.

The car makes inspection trips fast, simple and—mark you this—sheer fun. A man can see everything at a glance through the windshield and side windows.

So far as scheduling is concerned, the Central's "100"—a modified 1954 Chrysler Windsor—operates strictly as a railroad train. It shuttles back and forth on the double- and four-tracked main line working on standard yellow "flimsies," or train orders.

"Number 38 is behind you," the towerman will say as he hands the driver his orders. "You've got 22 minutes' clearance to Peekskill."

Approaching a signal gantry, an assistant calls out, "Red!"

"Red on the board," responds the driver.

He takes his foot off the accelerator and lets the car coast until the tower gives him a green. Now and then he has to touch the brake to keep from overrunning the signal before it turns. In automatic-signal territory, the car has to come to a full stop in front of a signal—

Wheels lock in place with a steel shoe . . .

RAIL CAR causes gates to drop and warning lights to flash as it approaches crossing. It carries its own warning system for less versatile vehicles—air horns front and rear.

it's not heavy enough to make the contact while rolling.

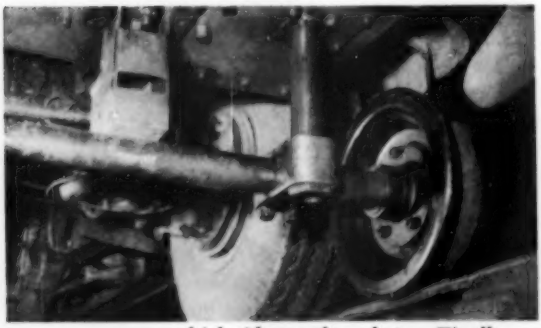
On the roof the car carries two red "marker" lights facing rearward and four amber caution lights forward. Above them is a red blinker. Standard automobile headlights bathe the track at night. Hand signal lamps, torpedoes and other regulation paraphernalia are carried in the trunk.

The car toots twice to go ahead, three times to back up, and gives forth lustily with two longs, a short and a long as it approaches a grade crossing.

Everywhere the car is driven, it attracts crowds.

"Hey!" exclaimed an enchanted upstate New York automobile dealer. "How can I get some cars like this? I could sell a thousand."

It attracts the cops, too. Soon after "100" was put in service last October,



. . . which rides on the axle top. Finally . . .

. . . a prong locks spoke of steering wheel.

With its flanged wheels tucked up, rail car joins mid-town traffic stream as a roadable sedan.

a police prowl car panted after it clear through the city of Troy, N. Y., to find out what kind of fool would be driving a car on the railroad tracks.

While it's driven by railroad brass, the master sergeant, so to speak, in charge of it is a reticent and gifted man named Lou Diffenbeck. Lou is an expert mechanic. They say of Lou that he can sit and listen to the beefs about an ailing diesel-electric locomotive, and nine times out of 10 diagnose the trouble without moving out of his chair.

Lou services "100." It's only a sideline with him, an added chore. It doesn't give him much trouble. His repairs usually consist of replacing things that get knocked off the undercarriage of the car. It's a ton and a quarter overweight, what with the special equipment needed to operate it, and despite hard springing, it "bottoms" on bumps.

Lou had a little transmission trouble when "100" went into service. Part of the drive—a standard Chrysler automatic—burned out when the car was backed up at 45 miles an hour. Examination showed that it wasn't the speed that was at fault but, instead, a bad installation. Nonetheless, "100" ever since has been placarded for a maximum of 15 miles an hour in reverse.

Normal servicing is no problem. Lou simply drives the car over one of the pits at the Central's roundhouse in Selkirk, N. Y.

It would be abusing the truth to say that "100" rides like a dream. Driver and passengers feel the hard suspension—necessitated by the extra weight—on both highway and rails. But that's forgotten in the zany, and occasionally unnerving, experience of hurtling down a railroad track in an automobile at a mile a minute.

A tidy bit of work had to be done to the six-cylinder Chrysler to convert it to off-and-on rail use. An air compressor was installed under the hood to raise and lower the flanged wheels.

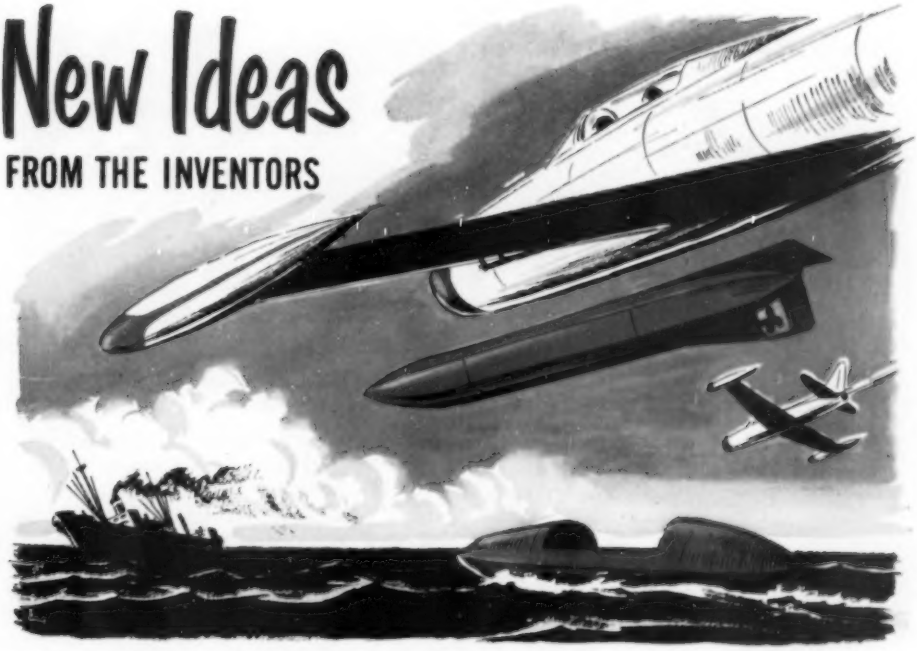
The pneumatic system is the same kind used for air-braking trucks. A reservoir two feet long and six inches in diameter, located under the car on the driver's side, stores the compressed air. When a pressure of 100 pounds to the square inch is reached, the compressor is stopped by unloader valves.

The air is piped to a distribution "header," and thence into lines leading to cylinders at the front and rear of the car. Valved into the bottoms or tops of the cylinders, it forces a piston up or

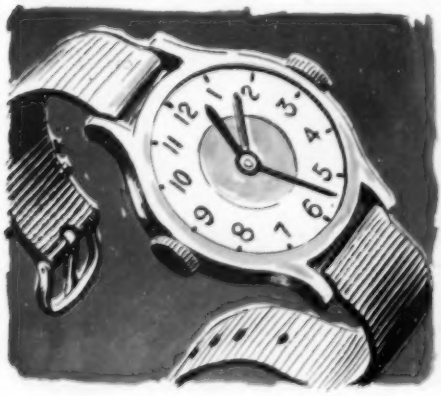
[*Continued on page 260*]

New Ideas

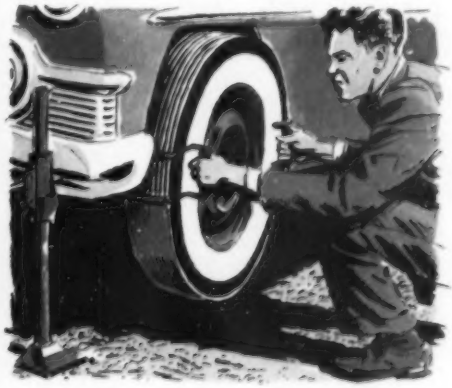
FROM THE INVENTORS



1 "Torpedo" to Launch Rescue Boat. Foundering survivors of a ship or plane wreck might stand a better chance of rescue if lifeboats could be aimed right at them by low-flying planes. Folded into bomblike projectiles, several of these boats could be carried under the wings or in the bomb bay of a plane and dropped accurately on target. Compressed gas would inflate and unfold the "bombs" into seaworthy craft.



2 Three-Handed Watch to Aid Travel. Commuters who go to work by Daylight Saving Time but have to catch trains on Standard timetables would find this three-handed watch, showing both, a help in keeping track of their schedules. Other travelers who cross time zones could also use it to avoid confusion.



3 Tire Grip to Keep Hands Clean. Changing a tire would not be as dirty—or backbreaking—a job if you could get a good grip on a wheel without actually touching it. This wheel-lifting cradle, consisting of two handles attached to a flexible metal band, would make it easier for you to balance, raise, lower or carry a tire.

Please turn the page for more new ideas

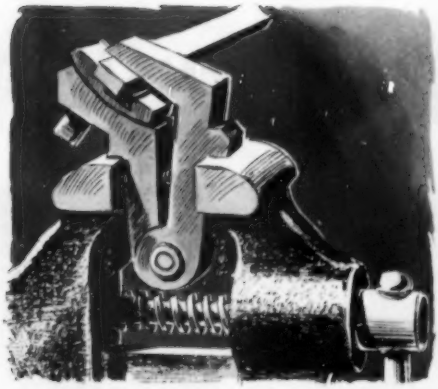
MORE New Ideas from the Inventors

4 Meter to Show Stopping Distance. Believing that many accidents happen because drivers fail to relate their road speed to unseen hazards ahead, this inventor would add auxiliary, foot-calibrated scales to a speedometer. They would translate speed into feet per second and show the safe stopping distance at any speed.

5 Electricity to Spark a Lighter. This flameless pocket lighter would use an electric heating coil like that in a car lighter to set your cigarettes aglow. It would be powered by a pair of miniature dry cells. A plunger would switch the coil on when the lid was raised, turn it off when the cap was snapped shut again.

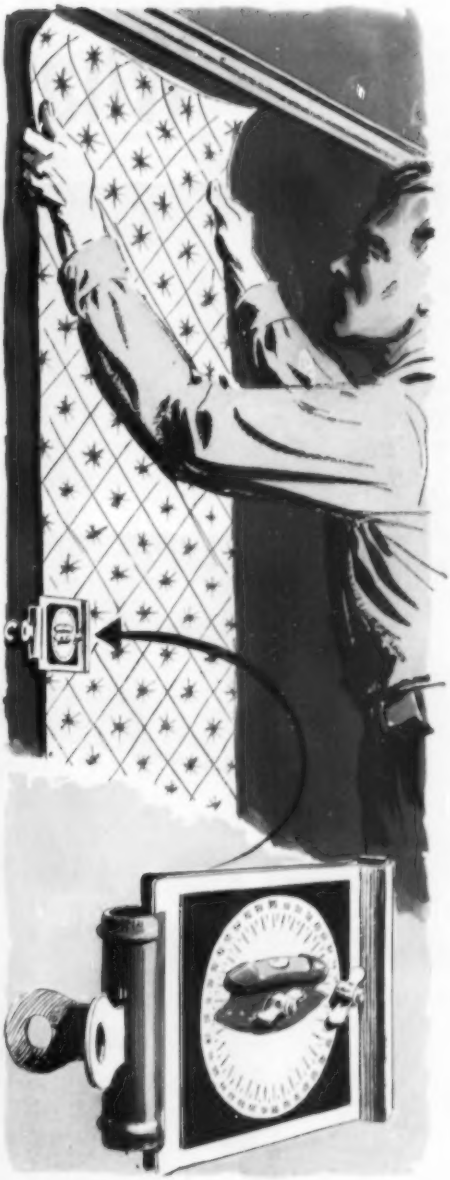
6 Two-Way Flash to Light Note Pad. Watchmen, guards, railroad checkers and others who have to make accurate written records outdoors usually have their hands full trying to read and write by the same light. This two-way flash would ease their task by casting one beam forward and another back over the note pad at the same time. A clamp at the back of the light would support paper in writing position. A transparent plastic hood would keep sheets and pencil dry in wet weather.

U.S. patents on these inventions have been granted to: 1. L. McCarty Jr. and H. Felio, NYC; 2. R. Israel, Corte Madera, Calif.; 3. J. Scuderi, Brooklyn, N.Y.; 4. N. Roderman, Los Angeles; 5. A. Tooker Jr., Valentine, Nebr.; 6. A. Littrell, Kennewick, Wash.; 7. C. Petersen, Brooklyn, N.Y.; 8. E. Wolper, Chicago; 9. C. Anderson, St. Charles, Ill.



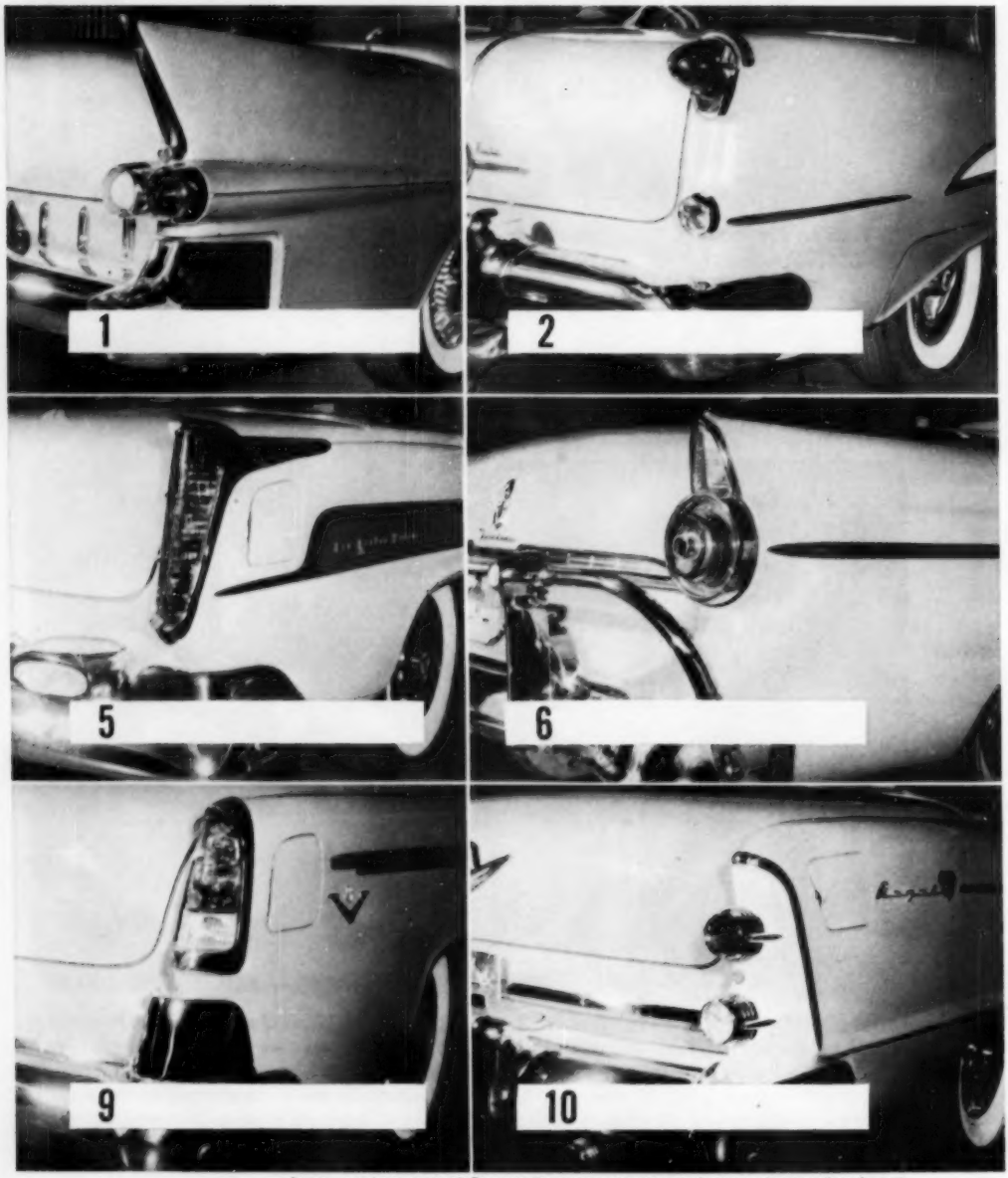
7 Vise to Fit in Vise. This "Vise Jockey," as it is called by its inventor, would adapt any large vise to hold small work. Shoulders on the pivoted arms would seat the clamp securely in the jaws of a conventional vise. And its own adjustable, self-aligning jaw would provide maximum grip for pieces of different size or shape.

8 Flasher to Work Off Lighter. By flashing its beacon on and off, this auto accessory would provide hard-to-miss warning of a stalled car. A plug at one end of its extension cord would fit the dash-lighter outlet. A suction cup would permit easy attachment of the signal to any convenient, prominent part of the car.



9 Dial to Line Up Wallpaper. A clip-on spirit level and angle computer might simplify the job of plumbing wallpaper. If this attachment were clipped to the edge of a sheet (or to a pipe or piece of structural timber), the bubble would tell when it was vertical. The level could also be rotated on a scale to measure angle of tilt.

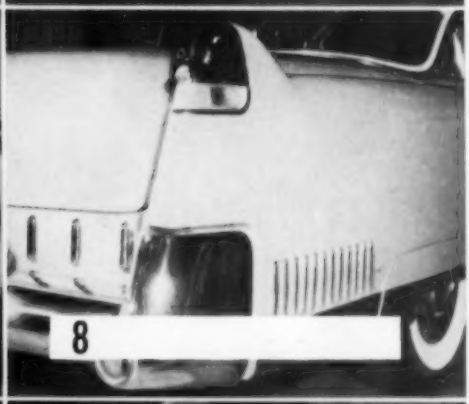
What New Car Just



5, Chrysler; 6, Ford; 7, Buick; 8, Cadillac; 9, De Soto; 10, Dodge; 11, Pontiac; 12, Mercury.

Passed You?

BY NOW, you've seen all the 1955 cars. But how sharp were your eyes as you strolled through the showrooms—or thumbed through recent issues of PSM? Try to identify the make shown in each of these close-ups. Then check with the answers at the bottom.



Answers: 1. Cadillac Eldorado; 2. Oldsmobile; 3. Chrysler's Imperial; 4. Plymouth;

Ships to Sail Across Cuba as Canal Opens New Sea Routes

THE century-old dream of a trans-Cuba canal for ocean-going vessels seems about to come true. Granted a government concession to dig the 54.3-mile waterway, longer than the Panama Canal, a Cuban company foresees its completion in four years. U. S. engineers engaged by the firm are currently conducting a final one-year planning survey.

Benefiting Western Hemisphere trade and defense, the Cuba Canal would open new sea routes (map). It would also tap the rich resources of Cuba's interior, where ships could reach sugar mills and take aboard their product in bulk.

The $150,000,000 canal, a two-way sea-level waterway, would require no costly locks. It would have a channel at least 170 feet wide and of 48-foot depth, ample for deep-sea shipping.

Tiny Carrier Plane for U. S. Navy Packs Atom-Bomb Wallop

SO SMALL that folding wings aren't required to store it below decks, this bantam U. S. Navy bomber, recently flown publicly for the first time, can carry an A-bomb. The mighty midget is the A4D Douglas Skyhawk, now in production for service aboard carriers. Its single jet engine gives it a top speed exceeding 600 m.p.h.

Can Science Stop Dust Storms?

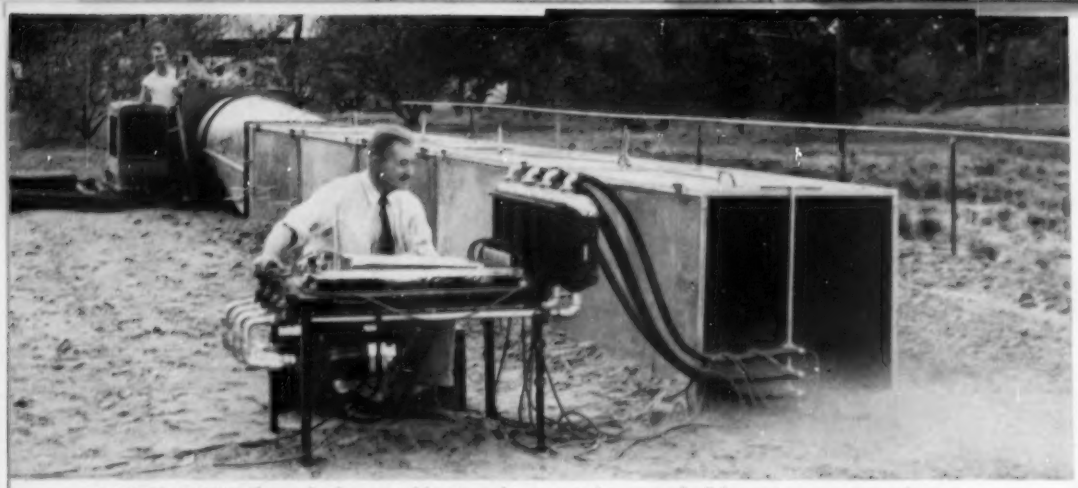
There's hope that the answer may be "yes" as experts create gales in a tunnel to show farmers how they can tie down their soil.

By B. F. Sylvester

A TEAM of weather-burned scientists in field boots, armed with a folding wind tunnel that they can tote on a truck, are out these spring days on the trail of a major menace to your food supply.

Their quarry is the grinding wind that, increasingly in recent years, has been scouring the fertile topsoil from America's Great Plains and scattering it hundreds of miles away in choking dust storms.

Fifty million acres of cultivated land lie at the mercy of these black blizzards. Last spring large sections of the U. S. suffered wind-blown soil losses that equalled the

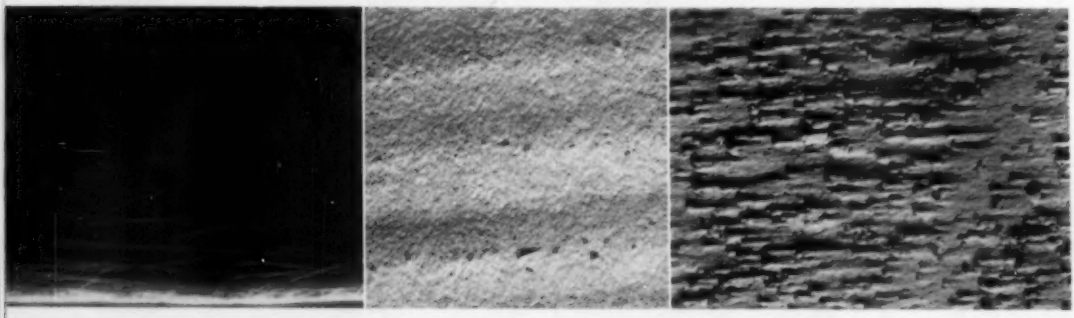


AS WIND BLOWS through the portable tunnel, dust samples are collected by suction hoses connected to sawed-off home-type vacuum cleaners. The amount of dust is also measured.

Soil men blow up a storm to duplicate Nature's action

WHITE STREAKS in this photo of a wind-tunnel dust storm show the leaping action of dirt particles—the flight patterns that cause erosion.

MAN-MADE WIND leaves rich farm land bare. Photograph at left below shows a patch of fertile soil before it was exposed to the eroding action of wind. Then wind tunnel was turned on, stripping off most of the topsoil, leaving the barren patch shown in second photo. Projecting clods protected remaining particles.



dust-bowl ravages of the dirty Thirties. Then came the hottest, driest summer on record, followed by a dry fall, pointing to more trouble this year.

What can be done to stop this destruction of our greatest national resource?

Soil scientists at Manhattan, Kan., are now getting some of the answers to that question by creating test-tube dust storms in wind tunnels. By studying how dust storms start and how they wreak their havoc, these scientists are finding ways to help the farmer keep his dirt tied down when the big blows strike.

The Manhattan dust-storm project, headquartered on the campus of Kansas State College, is sponsored by the U. S. Department of Agriculture and the college and state experimental stations. At its head are two world-known soil scientists, A. W. Zingg and Dr. W. S. Chepil.

Theirs is no stay-at-home job. At times they drive as much as 800 miles to stir up miniature dust storms with their portable wind tunnel.

This field model, 30 feet long, three feet wide and three feet high, is made of aluminum sections, open on the bottom. It can be set up on a farm in 15 minutes. The wind is provided by the power end of an old tractor and a three-foot ventilating fan. A governor and

manually operated vanes in front of the blower control velocities up to 40 miles an hour. The air is delivered through 324 two-inch aluminum tubes. These remove the whirl caused by the fan, straightening out the blast so that it simulates a natural wind as it roars through the tunnel and over the soil.

As the man-made wind whistles noisily away, the amount of soil blown out is measured and samples are sucked up by sawed-off home vacuum cleaners. When all the soil that will blow off has been removed, usually in less than half an hour, the wind machine is moved to another farm site. The amount of soil taken from a single 90-square-foot plot covered by the tunnel has run as high as the equivalent of a real dust-storm loss of 1,000 tons an acre.

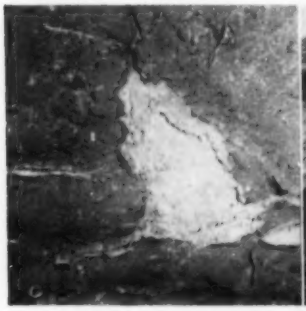
An important accomplishment of the scientists was learning the three main factors affecting wind erosion: make-up of the soil, surface toughness, and the amount of crop residue a farmer leaves as a cover.

Almost any cover left on a field is a help, they have found. What they plug for, however, is a heavy stubble and straw cover up to 18 inches high. But even a farmer who has kept no cover is

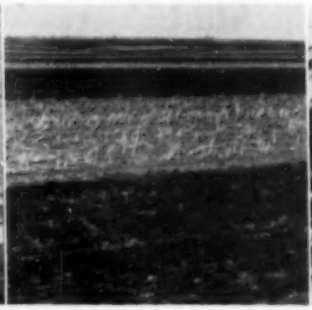
[*Continued on page 274*]

These steps protect croplands against the ravaging wind

ASPHALT-EMULSION cover protects completely against wind. Light area, where film has been removed, shows the highly erodible soil below.

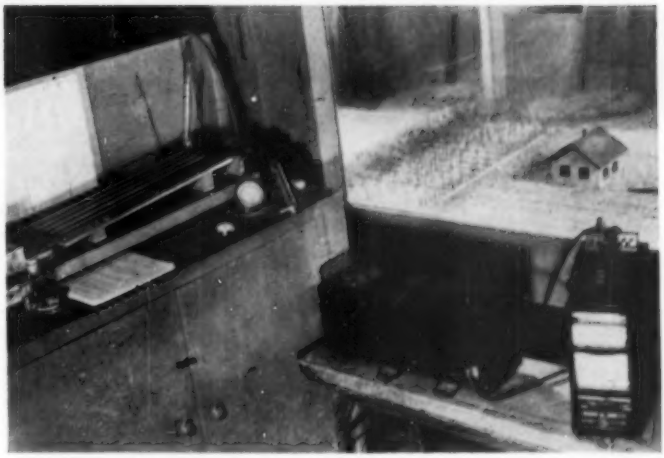


ALTERNATE STRIPS of stubble and cover grass hold soil fairly well. After several years of drought, however, even these will fail to halt the damage.



DEEP FURROWING is one workable solution. Ridges of wind-resisting clods do an excellent job of keeping the soil from being blown away.

LARGER laboratory wind tunnel has alternate glass panels. These enable Manhattan, Kan., soil scientists to study and photograph the birth of a dust storm from a breeze to a black blizzard. At far right can be seen a shelter belt of miniature trees, built to find out how much protection it will give a farmhouse and fields from the ravages of big blows. Wind velocities are measured by the instrument at left.



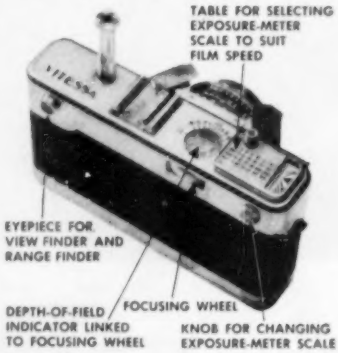
TIME-AND-FILM-SAVING FEATURE is new LVS Compur shutter with interconnected diaphragm. You set "Light Value" lever to number given by built-in exposure meter. Shutter-speed setting then automatically adjusts diaphragm to correct opening, which changes with shutter changes. To pick a desired lens opening, you move shutter setting. Same shutter is used on some other imported cameras, such as Ansco Super Regent, Rolleiflex.

Automatic Shift on Camera Links Lens Opening, Shutter

YOU just flip open the case and punch buttons with a new camera that does almost everything but compose the picture. The Voigtlander Vitessa L, a 35-mm. f/2, offers these automatic niceties:

- Flash built into the case lid. You can close the case with a bulb in the reflector.
- The diaphragm opening automatically changes whenever you change shutter speed—and vice versa.
- You can make pictures as fast as you can push two buttons. One advances the film and cocks the shutter; the other trips the shutter.

The de luxe model shown above sells for about $160 (without flash case). Willoughbys, 110 W. 32nd St., NYC, is the distributor.



They Say Now .....

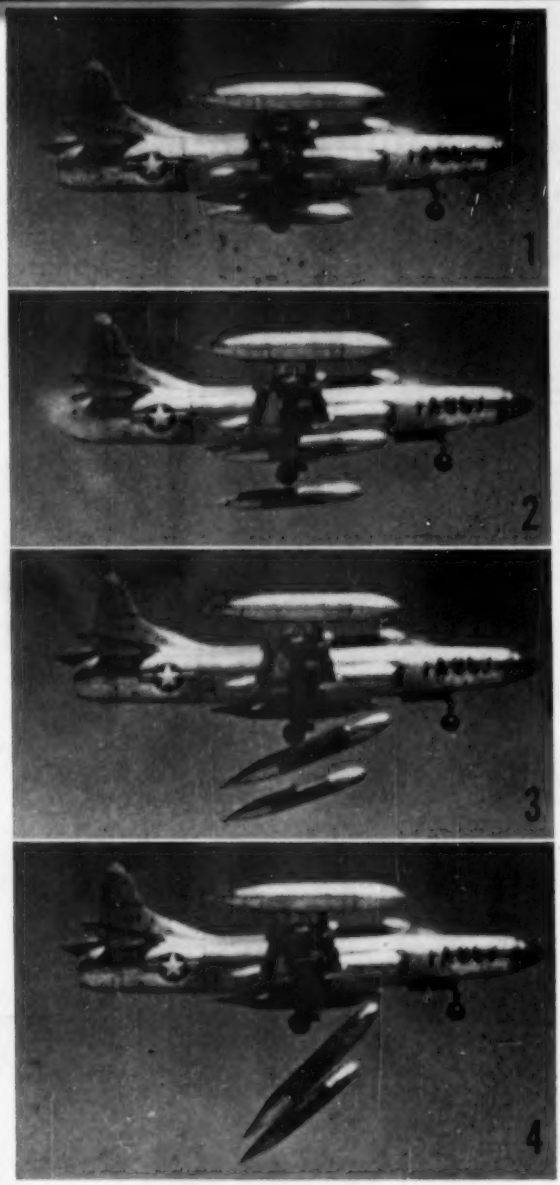
DR. J. ROBERT OPPENHEIMER: *"The frontiers of science are separated now by long years of study, by specialized vocabularies, arts, techniques and knowledge from the common heritage even of a most civilized society; and anyone working at the frontier of such science is in that sense a very long way from home."*

CRAWFORD H. GREENEWALT, PRESIDENT, DU PONT CO.: *"America was built by people who wore rose-colored glasses."*

DR. JEROME W. CONN, UNIVERSITY OF MICHIGAN: *"From the time of our birth, we come out fighting; aware of it or not, we fight for survival until we take our last and final breath."*

DR. ALAN GREGG, VICE-PRESIDENT, ROCKEFELLER FOUNDATION: *"The best thing an adviser does is to listen."*

RICHARD WEIL JR., PRESIDENT, NATIONAL ASSOCIATION FOR MENTAL HEALTH: *"Mental illness took a greater toll during the past year than ever before in our history."*



Gun Shoots Plane's Tanks Free

PILOTS of supersonic planes no longer have to worry whether dropped bombs or jettisoned fuel tanks will fall away cleanly. A new gun shoots them off the airplane, as shown in the series of photos above. The ejection system is enclosed in an underwing housing to which the bomber tank is attached. Two cartridges exploding in the gun chamber open the fasteners and drive a piston down to kick the bomb or tank away. Patushin Aviation says it works even when a plane is flying upside down.

Nutshells Blast Dirt Off Jet

RIGGED up like a spaceman, this worker is using a combination of rice hulls and ground walnut shells to blast off surface dirt on GE jet engines. The strange mixture, less harsh than sand, blasts out of the gun at nearly 1,000 miles an hour. Air spraying downward from the top of the helmet keeps the operator comfortable.

Barber Clippers Trim Plane Tail

THE aircraft worker above is giving an airplane a haircut. He's trimming nylon brushes with an electric clipper just like the one your barber uses. The brushes are set between fixed and movable wing and tail surfaces on big Learstars. Sheared close, the bristles close apertures to prevent drag-producing air flow.

"At least," the Doc had said, "my horse

Gus Rescues

GUS WILSON was standing by the gas pumps before his Model Garage when the commotion began. Down the street at a dead gallop came a rickety, ancient buggy, drawn by an old pot-bellied gray mare. With every leap of the frantic horse the black, tasseled top of the rig threatened to collapse on the driver, who sat on the high seat, a tremendous meerschaum pipe clenched in his bewhiskered jaw, urging the horse to greater effort.

The clattering passage of this outfit effectively shattered the peace. Folks ran from stores and shops to look, and some even leaped into their cars and took up pursuit.

"Doc Stanbury!" Gus Wilson gasped. "Somebody must be sick."

Stan Hicks, Gus's helper, was staring, too. "But Doc hasn't practiced medicine in years," he protested. "And why the horse? Doc owns a car."

"Hanged if I know," Gus said, moving to his car, "but I intend to find out. Take over for a little while, Stan."

Knowing Doc Stanbury as he did, Gus was inclined to believe that there was some sort of skulduggery involved in this horse-galloping business. Doc was quite a character about town. In the horse-and-buggy days Doc had been the town's only physician, a waspish, irascible man, smelling strongly of tobacco and disinfectant.

YET beneath Doc's rugged exterior lurked the warm, impish heart of a Huckleberry Finn. Doc was the person who had in exasperation squirted Mrs. Sam Hepworth in the face with a garden hose, to cure her of the fake heart attacks by which she held her meek husband under her thumb.

Doc had reluctantly pastured his beloved horse in favor of a car during his later years of practice. During the past three years his main activities had been built around hunting and fishing with his old friend, Todd Beacham, and playing

and buggy don't drop dead every night like that car!"

By Martin Bunn

a Competitor

poker with some of the boys at the club.

Topping the first hill at the edge of town, Gus saw that the fleeing procession before him was streaming into Todd Beacham's farmyard. Perhaps he was wrong, Gus told himself, in thinking that Doc was up to some sort of trick. Maybe Todd Beacham was sick. Todd would surely call on Doc Stanbury rather than any of the younger doctors. But why would Stanbury travel there by horse? Why didn't he use his car?

Gus had a hunch that he knew the answer. For the past few weeks Doc had been complaining loudly about town about the constant failure of a new battery which he had purchased from Roy Williams, who ran a newly established auto-supply house in town. The battery, according to Doc, went stone dead every few days while the car was in the garage overnight. Gus speeded up and joined the group in Beacham's yard.

"Who's sick, Doc?" someone asked. "Is Beacham sick?"

"Of course I'm not sick," Beacham said from the front porch. "My cow's got the heaves."

The onlookers, who knew that Doc Stanbury would be insulted if called upon to treat a sick cow, stood in stunned silence. Then it began to dawn on them what this was all about, as it had long since dawned on Gus. A snicker arose here and there.

"Cow with the heaves!" one man laughed. "Wait till Williams hears this!"

Gus had heard enough. He turned away, his mind full of confused thoughts. Doc, as he had suspected, was up to something. Irritated by his constantly dead battery, he was taking revenge on the man who had sold it to him. With a flair for the spectacular, and with, perhaps, a subconscious yearning to gallop his horse through the streets once more as he had done as a young doctor, Doc had called his plight to the attention of the town and held Roy up to ridicule.

Without uttering one single word, and

with Todd Beacham's cooperation, of course, Doc had managed to intimate that he could get around town faster with his old horse and buggy than with a car equipped with one of Williams' batteries.

It was a brilliant stroke of publicity, and undoubtedly, to Doc, a good joke. But to Gus there was more to it than this. Roy Williams' auto-supply store was a small operation with low overhead. There were businessmen about town who resented Roy's new business, and resented having to compete with him. Gus felt that around the poker table at the club, some of these businessmen might have needled Doc into his horse-and-buggy parade.

"I guess it's all right to get out . . . He seems friendly enough."

But would other people see this as clearly as Gus did? He'd be hanged, Gus told himself, if he'd have any part of it. The thought sent the Model Garage owner to Roy Williams' shop, where he entered, looked Williams in the eye, and told him flatly that he had had no hand in the farce.

"I DIDN'T think you would, Gus," Williams said evenly. "My brands of merchandise are new to folks and they don't trust them until they prove themselves out. Doc Stanbury bought my first battery, and since he's been complaining about it, I can't get anyone else to try one out. The worst part of it is that the more I try to straighten things out with Doc, the worse they get. I've exchanged batteries with him three times, and they all went dead at one time or another, while the car was parked overnight in his garage. This gives him a chance to claim that all my merchandise is phony. I'm sure there's a short in his car. If there is, I can't find it, and there's the rub. What can I do, Gus?"

"There's only one thing to do," Gus told him grimly. "Hire a competent mechanic to get the facts. Either your batteries are no good, as Doc claims, or his car has a short. It's as simple as that."

"You're right, Gus," Williams conceded. "I'll get Doc to bring the car in to your garage."

THE next day, Doc Stanbury drove his big sedan in. He waved aside Gus's offer to drive him home. "Don't bother," he told the Model Garageman. "I've got my rig around the corner. It's slow, but at least the horse and buggy don't drop dead every night like that car of mine!"

Working on the car later, Gus scratched his head in bewilderment. He was stuck. He could find no short in the car, and there seemed to be nothing wrong with the battery.

The battery took and held a charge. It stood up under 300-ampere breakdown tests. Snapping the battery ground wire against the frame yielded not even the sign of a spark to indicate a short. Nor would any instrument in Gus's possession show a short. Gus checked out every wire for breaks or bare spots. He tightened all wiring terminals. The fuse in the electric clock was the right size, so the clock could not be suspected. Nevertheless, to make sure, for here was the only known drain on the battery overnight, Gus disconnected the clock.

Hoping that he had in some way overcome the trouble, he turned the car over to Doc. Two nights later the battery went stone dead.

This brought a new suspicion to Gus's mind. Was Doc leaving a switch on at night, to keep the farce alive? Gus began to feel like a fool.

"This deal," he told Stan Hicks, "has about got me stumped. It would be use-

[Continued on page 252]

MECHANICS *and* HOMEBUILDING

What you should know about

Installing a Room Air Conditioner

SWELTERING at home in hot weather is no longer necessary. You can install a room air conditioner in a half-hour without help, except to lift the heavy main unit, and with tools you already have in the house. And prices run lower than you might expect—from under $200 to just over $600, depending upon the size, make and the de luxe extras you may want.

But give some thought before you buy one to operating efficiency and ultimate comfort. The location of the air conditioner, type of installation, size and ade-

ITEM	QUANTITY	FACTOR (multiply by)		COOLING LOAD
1. Window Area Exposed to Sun		Inside Shades	Outside Awnings	
a. East, southeast or south	sq. ft.	45	25	.....
b. Southwest	sq. ft.	65	40	.....
c. West	sq. ft.	100	60	.....
d. Northwest	sq. ft.	35	25	.....
Figure all windows for each exposure, but use only the exposure with the largest load.		If windows have shades *and* awnings, use awning factor only.		
2. All Windows Not Included in Item 1	sq. ft.	14		.....
3. Walls (lineal feet)				
a. Light construction, exposed to sun*	ft.	90		.....
b. Heavy construction, exposed to sun*	ft.	50		.....
c. Shaded walls or partitions (all walls not included in 3a or 3b)	ft.	30		.....
*Same exposure used in Item 1.				
4. Roof or Ceiling (one only)				
a. Roof, uninsulated	sq. ft.	16		.....
b. Roof with 1" or more insulation	sq. ft.	7		.....
c. Ceiling, with occupied space above	sq. ft.	3		.....
d. Ceiling, with attic space above	sq. ft.	10		.....
5. Floor (omit if on ground or over unheated basement)	sq. ft.	3		.....
6. People (number using room)	people	900		.....
7. Lights and Electrical Equipment in Use in Room	watts	3		.....
8. Doors and Arches Continuously Open to Unconditioned Space (width)	ft.	300		.....
9. Total Load				.....

ON THE AVERAGE...	
If your total comes to approximately...	**You need an air conditioner of...**
4,200	½ hp.
6,000	½ hp.
8,500	¾ hp.
10,500	1 hp.
16,000	1½ hp.

Finding the size conditioner you need

Sample problem: Assume you have a 12'-by-15' room with three exposures, east, south and west, and one 3'-by-5' window in each wall. You have both awnings and shades. Walls are of heavy construction. There is a ceiling with occupied space above, a floor over an unheated basement, and no open doors or arches. Three people use the room at one time. Electrical equipment takes 500 watts. Item 1 (15 x 60) is 900; item 2 (30 x 14) 420; item 3 (15 x 50 plus 39 x 30) 1,920; item 4 (180 x 3) 540; item 5, zero; item 6 (3 x 900) 2,700; item 7 (500 x 3) 1,500; item 8, zero. Total cooling load, 7,980. Chart at left shows that a ¾-hp. unit is needed.

and the less it will cost for you to run it.

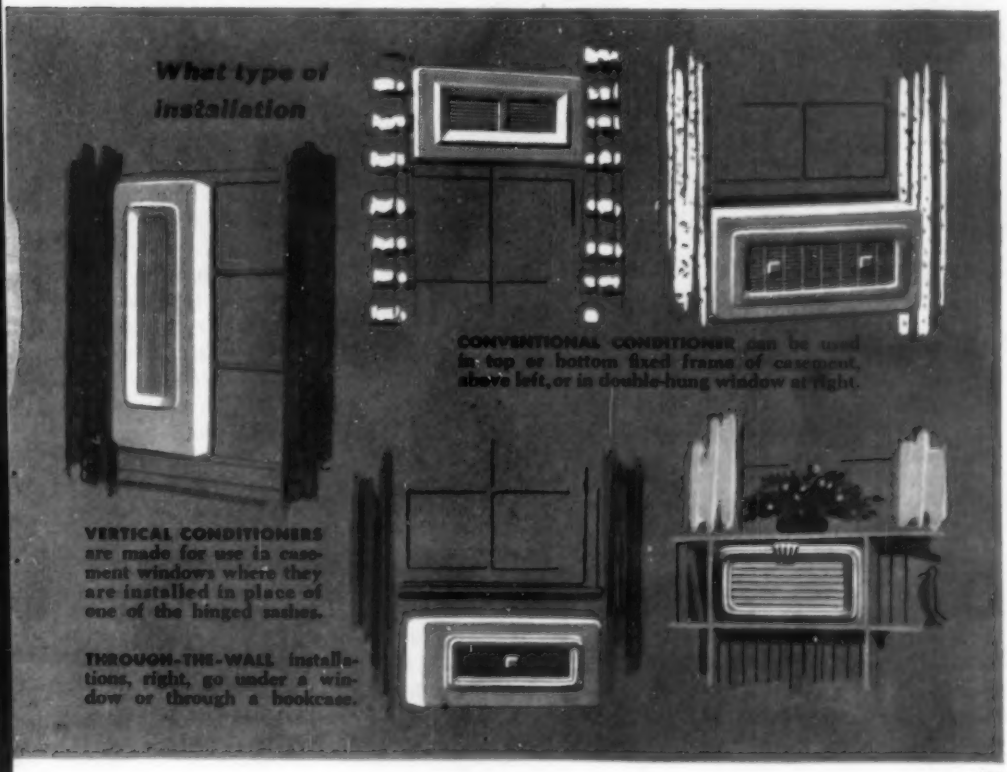
Then select from the table the con-

Where to locate NORTH WINDOW, left, away from hot sun, is best. For other exposures, shield windows with awnings or trellises.

quate wiring are all important factors.

Selecting a location. If the room you want to condition is on the north or a shady side of the house, you are fortunate. This can mean an initial saving as well as lower operating costs by allowing you to use a smaller (and less expensive) model than would be required for a western or southwestern exposure where you get the hottest and longest hours of the summer sun.

If the room isn't on the north, you can still make a saving by putting the conditioner in the window or wall least subject to sun. The cooler the air supply, the less work the unit will have to do



What type of installation

CONVENTIONAL CONDITIONER can be used in top or bottom fixed frame of casement, above left, or in double-hung window at right.

VERTICAL CONDITIONERS are made for use in casement windows where they are installed in place of one of the hinged sashes.

THROUGH-THE-WALL installations, right, go under a window or through a bookcase.

You can install your own room air conditioner

and the less it will cost for you to run it.

Shading the unit and all windows in the room will help. You can use awnings or overhanging trellises with leafy vines. If you don't like awnings or trellises, at least keep the shades drawn during the bright daylight hours.

What type of installation? Room air conditioners are commonly installed in windows, either conventional double-hung or casement. But installation through an outside wall is equally efficient and is becoming popular.

A conventional model is used in a casement window that has a fixed frame at top or bottom. You remove this frame and put the unit in its place. Special vertical models are made to replace one of the hinged casement sashes.

A conventional unit can also be used in a wall installation, with a slight adaptation of the cabinet to make it conform with the plaster or trim. A bookcase against an outside wall affords a perfect location in many cases.

What size? This requires some study. A conditioner that is either too small or too big for the space it must cool will do the job inefficiently.

To determine the cooling load your conditioner will carry, don't rely on a rule of thumb such as dividing floor area by 600 to find the horsepower it needs. There are many considerations involved, and floor area is only one of them. Others include the number of windows in the room, the directions they face, whether awnings or plantings screen them from direct rays of the sun, wall construction and insulation, and even the number of electric lights on and the average number of people in the room at one time.

To size a room, as the experts say, fill out the accompanying cooling-load chart, multiplying each item by the appropriate factor, and add the results.

Then select from the table the conditioner that will handle the total load with a little to spare. There are five basic sizes: ⅓, ½, ¾, 1 and 1½ horsepower (or tons—the words are used interchangeably).

Load ratings vary slightly with manufacturers. Those in the table are average. Your dealer can give you exact ratings for models he handles, or you can get independent ratings from the American Society of Refrigerating Engineers.

Once you have selected the size conditioner you need, don't try to stretch it to cool a second room. If you want to include an extra area, such as a dining L at the end of a living room, figure the total space in the cooling load and install a suitable conditioner in a window or wall facing both areas.

Keep the doors to the room closed—and the windows, too. You can't cool all outdoors, and it costs money to try.

Will you need new wiring? This depends on the size conditioner, but all require a separate fused circuit on which there is no other appliance or load.

The ⅓- and ½-hp. conditioners operate on 115 volts. Most ¾-hp. makes are available in both 115-volt and 230-volt models. All 1- and 1½-hp. models are 230 volts. Most manufacturers also put out their larger units in special voltages common to many big apartment houses.

Is your wiring adequate?

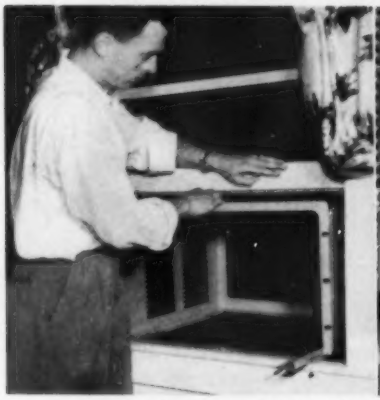
Size of Unit	Voltage Required	Separate Circuit?	Minimum Wire Size	Fuse with Time Lag
⅓ hp.	115	Not necessary	—	—
½ hp.	115	Yes, for best results	No. 14	15 amp.
¾ hp.	115 or 230	Yes	No. 12	20 amp.
1 hp.	230	Yes	No. 12	20 amp.
1½ hp.	230	Yes	No. 12	20 amp.

Requirements for air-conditioner models

You will, of course, need a convenient outlet. If an extension is necessary, don't use an ordinary appliance cord for a 115-volt ¾-hp., or larger, conditioner. Use No. 12-gauge wire at least. The separate circuit should also be of the heavy-duty type and should be equipped with a heavy-duty receptacle.

For a 230-volt model you will need a 230-volt circuit, with no other appliance on it, just for the conditioner. This is no great problem if you already own an electric stove or clothes dryer. You simp-

You can install your own room air conditioner



IN TYPICAL INSTALLATION cabinet is centered in window and held by sill clamps and sash.

CABINET IS ADJUSTED with level (arrow) by long bolt in support brackets against outside sill.

SPACER PANELS close openings on sides. Cabinet edges are then sealed with rubber strips.

FELT ON LOWER SASH keeps warm air from entering through space between the two panes.

IT TAKES HELP to set main unit in place. Abutting parts of unit and cabinet are also sealed.

FINISHING TOUCH is screwing on panel and grille. Time: 30 min. *(Photos by Westinghouse)*

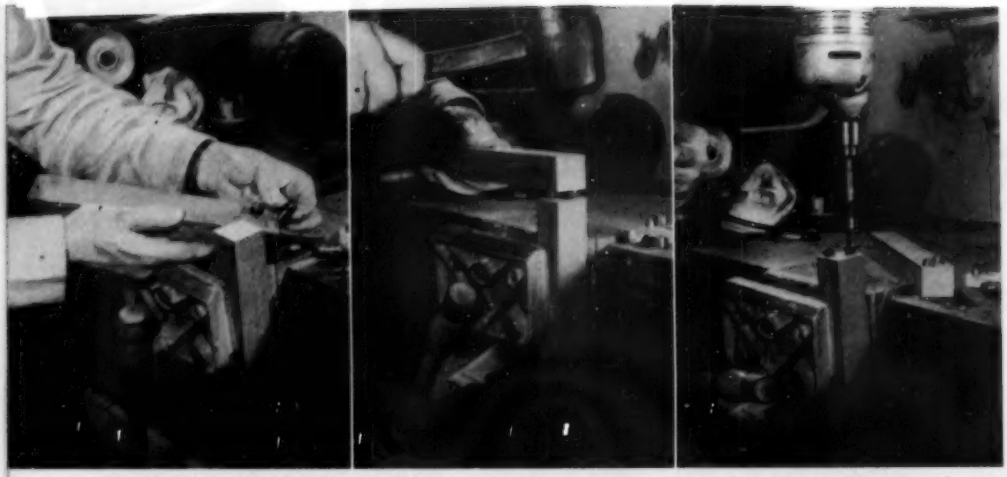
ly run a separate 230-volt fused circuit from the main electrical panel.

If you do not have 230 volts available at the panel, a line must be run to it from where the utility line enters the house. In most cases—and by law in most communities—this is a job for a licensed electrician.

How to install it. Window installations are easiest. Detailed instructions come with the conditioner, and steps vary but little with the make. You also get a complete kit containing all the accessories you need. Tools for the job are basic: screwdriver, wrench, awl, scissors, rule and level. You can have the unit in operation half an hour after opening the packing crate.

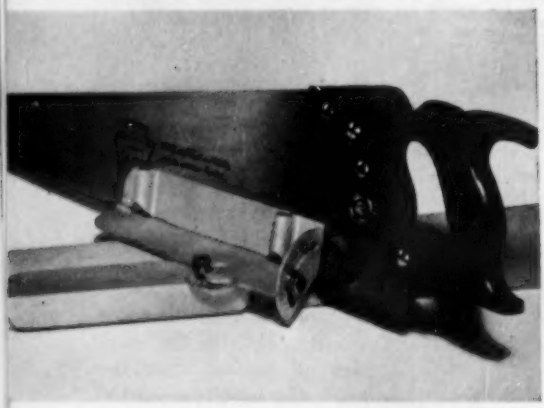
Wall installation requires a little more work. After you cut a hole in the wall, at least 1″ larger all around than the conditioner cabinet, the unit is mounted in the opening with the same supports supplied for window installation. Gaskets of wallboard, molding or similar material are used to fill in the opening at top and sides.

If the wall is thick, you may have to make the hole larger—for clearance of 2″ or more at each side. This prevents blocking up the innermost louvers and lets the air circulate.—*George H. Waltz Jr.*



1. Guides Align Dowel Holes. There's no guesswork in lining up dowel holes with these markers. Holes are first drilled in one piece and steel pins slipped into them (above left). Around each pin is a sharp-edged, loose-fitting collar. When the first piece is tapped against the second one (center), the collars are left embedded exactly opposite the pins. The collars then guide the drill for making matching holes. The markers come in sets of six—three pairs for ¼", ⅜" and ½" dowels.

New Tools



2. Miter Makes Compound Cuts. Two protractor adjustments tilt this miter guide to both vertical and horizontal angles at the same time. The saw blade is held firmly to the guide by two permanent magnets set in the cast-aluminum frame.

3. Adapter Saves Taper Tools. Taper-shank tools with worn or broken tangs can be re-used with this spring-steel adapter. The coil body locks instantly around a tool, yet you can remove it easily with a twist in the opposite direction. The adapter is available in sizes 1 to 5 to fit drills, reamers, end mills and other tools that have Morse-taper ratios from 1:2 to 5:6.

4. Holders Start Nuts. Starting nuts or bolts in hard-to-reach places is easy with these extension holders. Spring-wire cups at the ends of each rod grip square or hex-head nuts until they're threaded on, then pull off easily. The set of four holders takes eight sizes of metal, plastic or fiber nuts from 3/16" to 7/16".

Further information about the tools shown on this page can be obtained from: 1. C. C. Whittaker, 541 Briar Cliff Road, Pittsburgh 21, Pa.; 2. Aluminatool Division, Bay City Foundry, 133 N. Avalon Blvd., Wilmington, Calif.; 3. Pilot Tools, Inc., 225 Lafayette St., NYC 12; 4. Bonney Forge & Tool Works, Durham and Meadow Sts., Allentown, Pa.

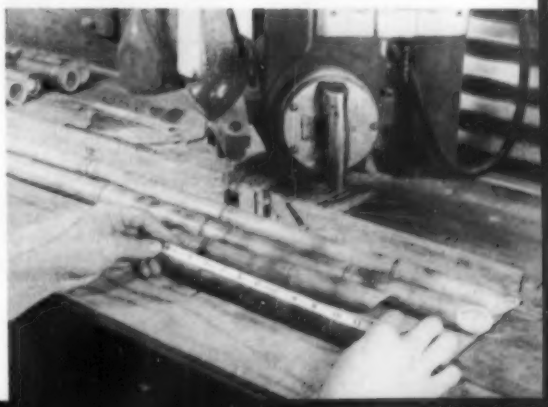
What You Can Do with Bamboo

Nature supplies the shape and finish. All you do is split and slice the stuff into tables, planters and even drinking mugs.

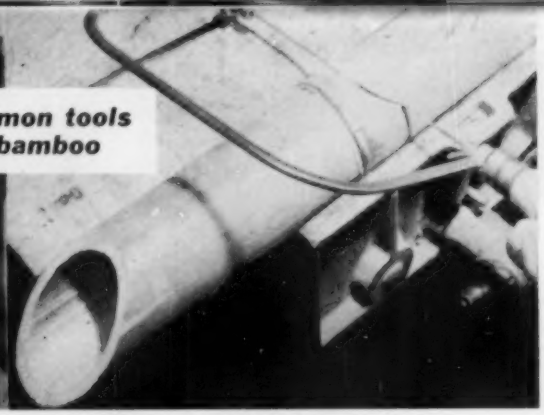
By Jerry Parker

IN THE Orient, they use all of the bamboo but the rustle of its leaves. Where you live, it can be good for many things besides fishing poles and plant stakes.

As a change of pace—and also to show how versatile you can be—you might try making a few things out of this surprising material. From drinking mugs



Use common tools to work bamboo



HACKSAW WORKS FINE for crosscutting bamboo. But be sure to ease up on pressure toward the end of the cut to avoid ragged edge.

CUTTING CURVES or notches is easy with a coping saw. For most projects, cuts are made on either side of the ringed node sections.

to picture-window trellises, they'll be different from anything else you've done.

The finish grows on it. Workshop-wise a handsome hardwood, tough and immensely strong, bamboo is actually a relative of the grass family. Its hard, good-looking surface requires no finish, although you can paint, enamel or lacquer it with some very colorful results.

The poles, called culms, vary in diameter from ½″ up. One variety grown in Georgia is guaranteed two years against cracking and splitting. It comes in 6′ to 14′ lengths and up to 3″ in diameter. Prices run from 33 to 75 cents per foot.*

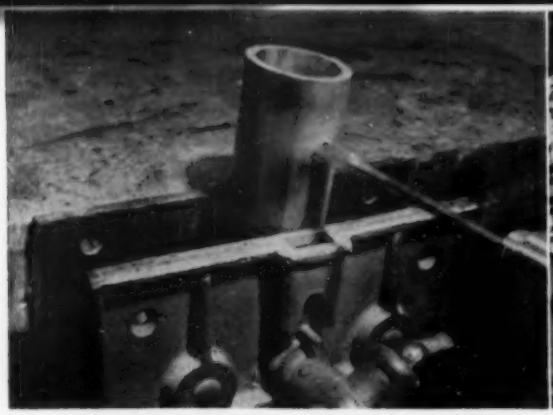
Imported bamboo ranges up to 5″ in diameter. Sizes up to 1″ can be bought from large garden-supply houses, which

*My source was Thomas Crandall, P. O. Box 204, Atlanta 1, Ga.

MUG BOTTOMS grow naturally. The nodes or cross walls between sections form ready-made bottoms for tumblers, mugs and vases. Cut a 2½″ or larger culm about 1″ below and 5½″ above a joint. A bamboo ring forms the handle. Sand the hard skin off joining surfaces and attach the handle with waterproof glue and a single small bolt, or with wire or cord binding. Bamboo vessels can be washed in hot water, but they should not be left to soak.

PLANTS ARE A NATURAL in bamboo planters; the finish blends with growing things. Use 2½″ or larger culm to make wall planter at right. Cut it at 45° about 5″ above joint. Just below joint saw a 3″-long notch for second plant. Leave nodes in at center and bottom to hold soil. For third pocket, leave on third section.

TABLE PLANTER is made by cutting outside two joints and sawing out long notch between. Keep nodes in to contain soil. For feet, split bamboo ring in half, attach with small bolt.



HARD OUTER SKIN calls for care in starting holes true. Use a flat or twist drill—but never an auger bit, which will split stock.

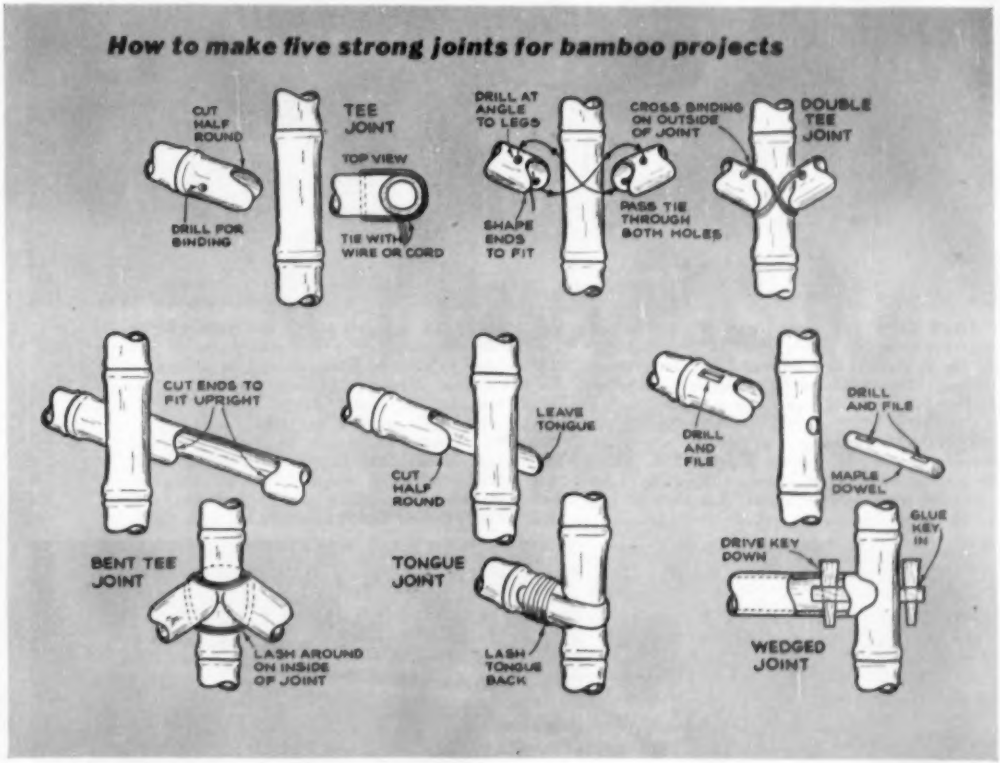
MACHETE IS HANDY for splitting culms, but a kitchen knife will work, too. Knock out the nodes first by driving in pipe or rod.

sell 4′ to 7′ poles as plant stakes, for as little as $2.50 a hundred.

Bamboo grows wild in many of our states, as far north as New York. If you have it in your own back yard, think about harvesting some for workshop uses. It will pay you dividends.

How to work it. The main thing to remember is to predrill holes in bamboo for nails as well as screws. If you don't, it will split every time.

You can take advantage of this for making half- and quarter-rounds, strips, molding and the like. First knock out the nodes—the pith walls between the ringed sections—by ramming a pipe or rod through the culm. Split by tapping a big knife through from one end. The



BAMBOO TABLE is ideal for patio, porch or informal serving. It requires no finish. Top is 1¼″ pine, trimmed on edges with bamboo.

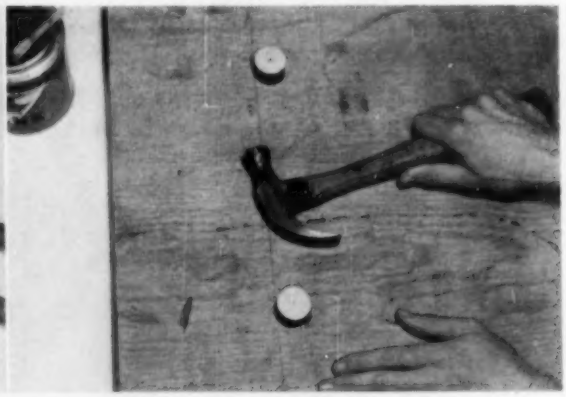
bamboo will part before it. Should one side start splitting smaller than the other, hold the small half straight and bend the larger away from it.

Use fine-toothed blades for cutting. Node sections can be reduced with sandpaper, rasp or plane. Save scraps for such desirable trifles as napkin rings, match holders, salad spoons and forks.

You can bend it. After knocking out the nodes, advises Walter Lutz, bamboo artisan of Cleveland, pack the pole with sand and heat cautiously over charcoal or a stove burner. Bend with gentle pressure, reheating if necessary. Plunge it into cold water to fix the curve.

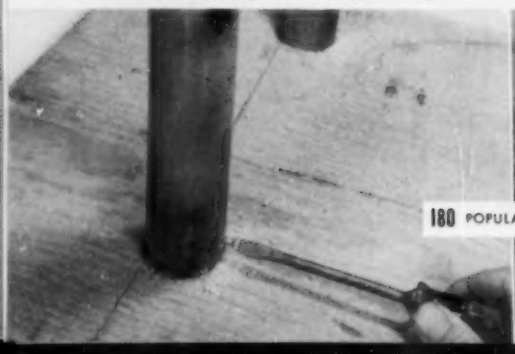
Raffia, caning, plastic lacing, cord or wire are used to bind ends. Wrap the binding tight, push the end under, and secure with cement or an escutcheon pin in a predrilled hole. END

CUT FOUR LEGS 27″ long from 2″ or larger culms. Avoiding the joints, drill ⅞″ right-angle holes for stretchers cut 48″ and 12″ long from 1″ culms. Miter ends to fit together inside the legs. Rasp or sand the ends to a taper.



GLUE AND NAIL wooden plugs, cut from a large dowel or closet pole, to the underside of the 18″-by-60″ table top. These should be same size as the inside diameter of legs for a snug fit. Make the plugs at least 1″ long.

IN PREDRILLED HOLES set a slender screw in each leg to hold to dowel plugs which have been coated with glue before mounting. Lay out top for plugs with care so that they fit leg assembly and are spaced evenly at edges.



SPANISH WINDLASS, made by tying doubled rope around all four legs and twisting tight with short lengths of wood, serves as clamp to hold stretchers in place until glue has set. Table top, on floor, holds opposite leg ends tight.

New Brush-On Sealers Keep Basements Dry

Here's the inside dope on dampproofing your cellar. New masonry paints actually become part of the wall.

By Bernard Gladstone

TOUGH, new waterproofing paints let you seal moisture out of porous cellar walls with a brush. You can slap them on quickly, since there's nothing finicky about the way they're applied. And once up, they actually become a part of the wall.

For unusually serious water conditions, you can use the sealers in combination with a plaster base. For open cracks, there are new hydraulic cements that will plug up a hole while water's still run-

ning through it. The new sealers are called heavy-duty cement-base paints, and when you buy them make sure that you get the type that is specifically designed for waterproofing. Not all cement-base coatings are.

These paints come in powdered form and are mixed with water just before use. While they're normally applied as a thick coating, you can mix them to a plasterlike consistency and trowel them on.

If your walls are just damp because of an over-all seepage, the chances are that two brush coats will do the trick. But where you can actually see water dripping down over large areas of wall, you'll probably need one heavy trowel coat, followed by one brush coat.

USE A SPOON to force hydraulic cement in crack between wall and floor. Chisel out fine cracks enough to let cement in.

Walls must be clean. To provide a good grip for the sealer, your masonry surfaces must be clean, dry and porous at the time you paint them. If they have already been treated with anything other than a cement-base paint, the pores may be too tightly sealed to let the new coating penetrate.

You can run a quick test by slopping on some water. If it seeps in and wets the wall, you're all set to go. But if it just runs right off, the old surface will have to be removed first.

For oil paints, use a no-wash, semipaste remover, one that contains no wax and preferably one of the water-soluble types. Flow it on with a large brush, allow the paint to soften, and scrub it off with a wire brush and some mineral spirits. Then wash down the wall with a hot solution of trisodium phosphate and rinse with clear water.

For whitewash and other water-mixed paints, use muriatic acid, the wire-brush treatment, and the same bath of trisodium phosphate. You can get the phosphate at paint stores under the name of beetsol. Mix about five pounds with each gallon of water. These chemicals don't take kindly to eyes or skin, however, so wear goggles, gloves and a long-sleeved shirt, and wash up thoroughly afterward.

Patch cracks first. Before you start applying the sealer, all holes and cracks should be tightly plugged with one of the new quick-setting hydraulic cements. These come as a powder and are mixed

with water to a stiff puttylike consistency. After all openings have been patched, spot-prime them with a little of the same coating that you will use on the walls.

DRILL WEEP HOLES to drain water at base of wall. Use star drill or masonry bit in portable drill.

Where water is seeping right in through the masonry, the pressure must be relieved behind the wall by drilling weep holes along the bottom. After the water has drained out, you can seal the wall and plug the holes with hydraulic cement.

Sealer goes on quickly. Just before you're ready to start, wet down the wall with a fine hose spray to help draw the coating in. Also keep a pail of water and brush handy so that you can remoisten any spots that dry out before you get to them.

Mix only as much paint as you can use in an hour or two, since it sets up rapidly. Work it well into all cracks and pores, but don't fuss about brush streaks or lap marks—there won't be many.

Before you put on a second coat, read the directions on the particular brand you have bought to see how much drying time is required, the correct proportions to use, and whether the coating needs to be kept damp while curing.

Plastering bad walls. Some walls may be so porous, cracked, crumbly, or otherwise defective that even the new heavy-duty coatings won't hold back the water. You can often solve this by replastering the walls before adding the sealer.

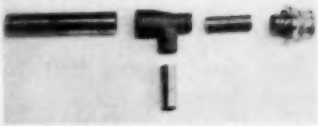
Since this means more work, try the sealer alone on at least one wall first to see what happens. And if you do decide to plaster, try that, too, on one wall before you undertake the entire job. If the wall is wet at the time, use the same system of drilling weep holes, only drive in short lengths of pipe to keep them open as you plaster around them.

PLASTER BASE seals bad walls. Mix sand and cement two to one, trowel on two ⅜" coats.

Keep the inside dry, too. Many wet basements are made even wetter by warm, moist air that collects inside and condenses on the walls. Vent clothes dryers to the outdoors.

If you have a shower, darkroom or other source of moisture, it can be vented with an exhaust fan. Cold-water pipes that "sweat" should be wrapped with special insulating tape.

If you still have a lot of condensation, you can get inexpensive chemical dehumidifiers at hardware stores that help absorb moisture. Or you can try to get your wife to stop hanging wet wash in the cellar—but that idea may not work. END



THESE ARE THE PARTS you need in addition to hose. Body of pump is a ¾"-to-½"-by-½" reducing tee. Discharge nozzle is a 4" length of ¾" copper pipe. The female hose coupling is connected to 2" length of ½" copper pipe, and the suction side connects to a similar piece.

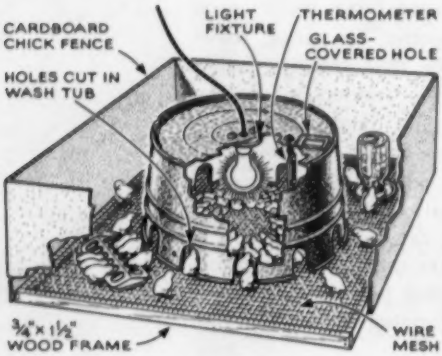
REMOVE CLAMP RING from the hose coupling by prying or snipping it off. Then saw the hollow stem to ½" in length and slip it over the end of one 2" length of pipe. Bore or file out the small end of the tee until this pipe can be pushed all the way through.

CLEAN ALL OPENINGS of the tee with steel wool. Push the jet tube with the hose coupling in past the cross opening until it just enters the ¾" section. Then heat and flow solder into all joints. Push an 18" length of hose over the side pipe for the suction line.

Homemade Jet Pump Empties Pool

CHANNELED through a few pipe fittings, the flow from a garden hydrant can raise water from another point. Its velocity creates a partial vacuum, and atmospheric pressure does the rest. You can use such a jet pump to drain a wading or garden pool and to draw out sand and dirt from the bottom. Average line pressure will pump about 3 gal. per minute to a height of 2′.

Turn the water on full force. Prime by blocking the discharge with your thumb and backing water into the suction line. Release your thumb, and the pump goes to work.—*Elbert Robberson, Port Washington, N. Y.*



You Can Raise Chicks in a Tub

FOR raising chicks on a small scale, this wash-tub brooder is a money-saving substitute for commercial equipment. An electric lamp provides heat. The size of the bulb needed depends upon the number of chicks and the prevailing outside temperature. Between 90° and 98° is usually recommended for the first month. Wire mesh over a wood frame makes cleaning easier.—*Victor H. Lamoy, Upper Jay, N. Y.*

▶▶▶You can reach the oil hole of an exhaust fan without removing the grid if you slip a drinking straw over the spout of a small oilcan.—*Martin Koenig, Brooklyn, N. Y.*

ACCESS TO TRUNK without unhooking outboard is important, makes picnic things readily available to the missus. Angle at which motor rides keeps residual water out of power head.

My Outboard Rides on The Bumper

An afternoon's work will put your oil-dripping outboard where it can't hog valuable space, or mess up or gouge your luggage.

By. E. F. Lindsley

YOUR car trunk is no place to haul a bulky outboard. A bumper bracket solves the problem.

Before starting to build the bracket shown in these photographs, I slung my motor on a rope to the garage rafters to get a picture of how it might ride best. I tried it upright, horizontally and finally at an angle.

Two faults were apparent at once with

CLAMPED TO STEEL BRACKETS attached to bumper and car frame, the motor can't swing on its axis into the trunk lid. The license plate, moved out to one of the brackets, is now visible.

the upright position. I couldn't carry the motor too low or the propeller and skeg might drag bottom as I started up a steep drive—or piled through a rutted backwoods road. If I shoved it up, there was no easy way of bracing to keep it out of the rear window in case of a sudden stop.

Slinging the motor horizontally looked better. But this had the same drawback as hauling it on its side inside the car—water left in the lower end could sneak into the highly polished cylinders.

Finding an angle. Finally, I tried cocking the motor up at an angle with the business end somewhat up in the air. That not only licked the water problem, but helped sneak the shank around the bumper guard.

The bracket can be built in an afternoon. I welded the joints, but rivets or bolts can be used. Just be sure the mount is husky enough to carry your motor.

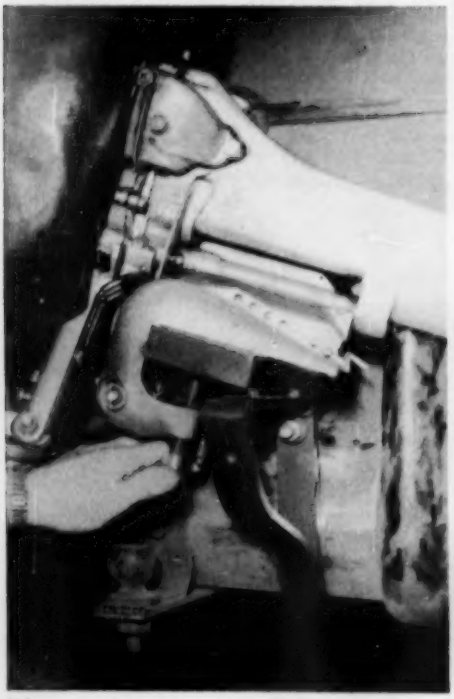
The first rig I made was constructed of ⅛″ strap iron and latched onto the bumper like some light-duty trailer hitches. The result scared me. Every time I jiggled the motor, the bumper twisted and flexed like a lizard's spine. One thing was certain. If I should hit a chuck hole or lake-country trail, that heavy motor would build up a whopping load of inertia.

So I made another mount. Maybe the ⅜″-by-1½″ steel looks heavy, and tightening the bolts on the rear frame member may soil your clothes, but it's strong enough and it works.

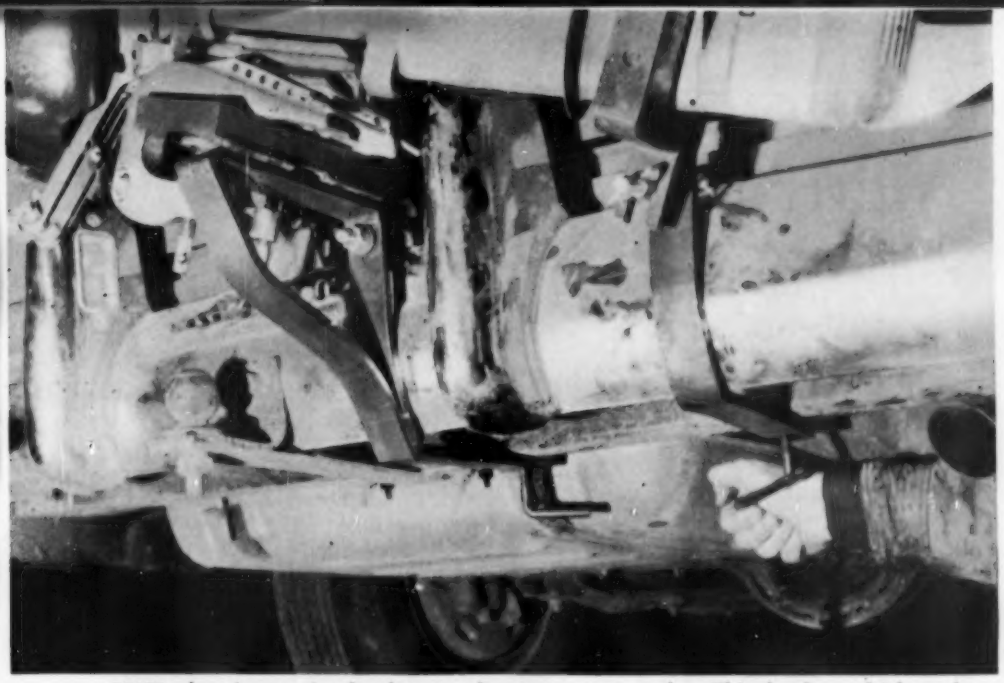
Forming the mount. To bend the steel I used a vise, an overgrown monkey wrench, and a blowtorch to soften it up. If this seems too rough, the local blacksmith can do it in a hurry. The hinges can be the cheap chicken-coop variety.

Don't sell yourself short on the clamp bolts that secure the support brackets

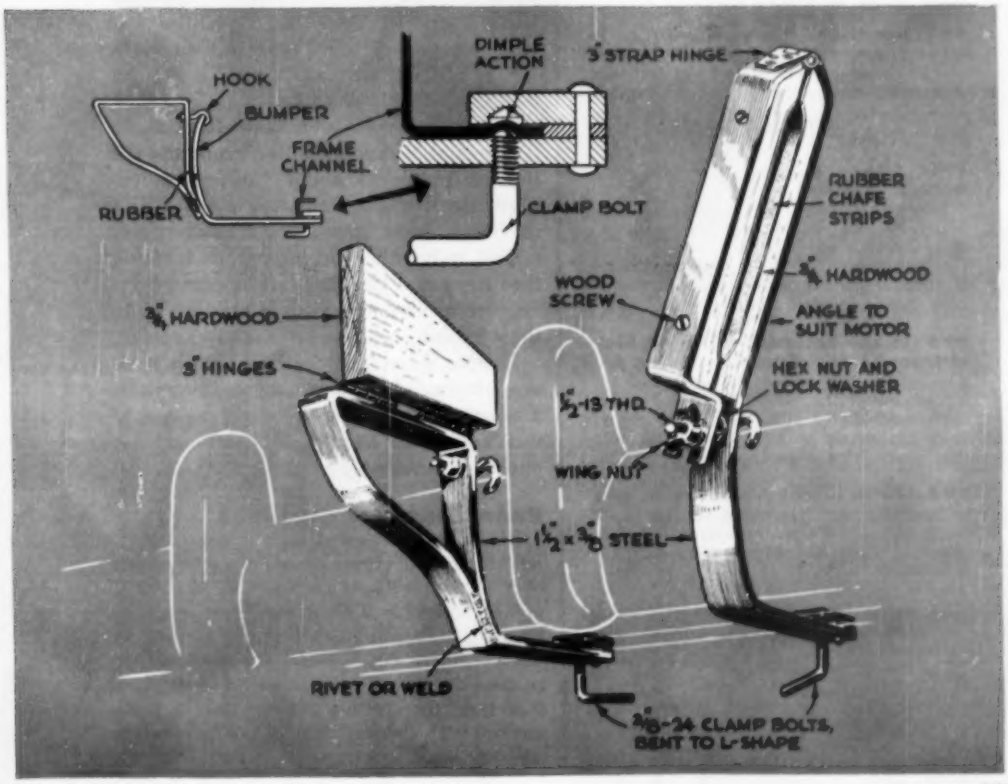
MOTOR CLAMPS hold on hinged hardwood block as they do on boat transom. The closer you can mount unit without interfering with trunk lid, the less leverage you'll have on bumper.



OUTBOARD FIN is locked to carrier by clamp held with wing nut. Wood insert, contoured to shape, is lined with inner-tube strips as are all metal surfaces contacting chrome.



BOLTS clamping carrier brackets to the car frame must be pulled up tight against the frame cross member. This absorbs road jolts and prevents twist on the bumper.



ALMANAC
FOR MOTORISTS

Pithy proverbs, provident counsel and omens and portents of interest to horseless-carriage operators.

▶▶**If all the people** who, in the course of changing a flat, discovered that the spare itself needed air, were laid end to end, there'd be an awful lot of people lying around.

▶▶**When the car is washed,** there is often a powerful temptation on the part of the proud owner to "get out the wax and shine her up." Resist it—finish experts say you should always use a cleaning polish on a car before waxing it.

▶▶**Is there a canary** in your engine? First places to look in chirp-hunting are the generator and water-pump bearings. If they are silent, see if the distributor cam needs a dab of petroleum jelly.

▶▶**Says the Saturday-Morning Mechanic:** "A pile of troubles 'looking for a chance to happen' can be headed off by a look under the hood. You'll see wires that may chafe, filling sediment traps, weeping gaskets, and the loose air cleaner that makes that alarming knock."

▶▶**Aside to hitchhikers:** Get out and walk if the man who picks you up is an angry driver, bent on "teaching that slob ahead a lesson." Blowups can be as risky as blowouts.

to the frame. I bent a couple of husky bolts into an L shape, and drilled and tapped the strap. If your car is shaped a little differently at this point, you may have to cook up a variation, but be sure you get a good, solid grip on the frame. These clamps take the twist off the bumper, and tie bumper and frame together for rigid support.

The jaw gimmick that clamps on the fin at the lower end of the outboard has a wood insert held by screws and lined with rubber. If you want to switch from one motor to another, it's a quick job to hew out a new insert to fit the new motor contour. In a pinch, I've taken out the wood, wrapped the fin with cloth to fill up the space, and locked the jaws down tight. These jaws are important since they keep the motor from swiveling and slamming against the trunk.

It wouldn't have been too hard to bend up a couple of hooks to hold the brackets to the bumper, but the garden variety of porch-swing and clothesline eyebolts go for 15 cents. By sawing off a quarter of the eye they do fine.

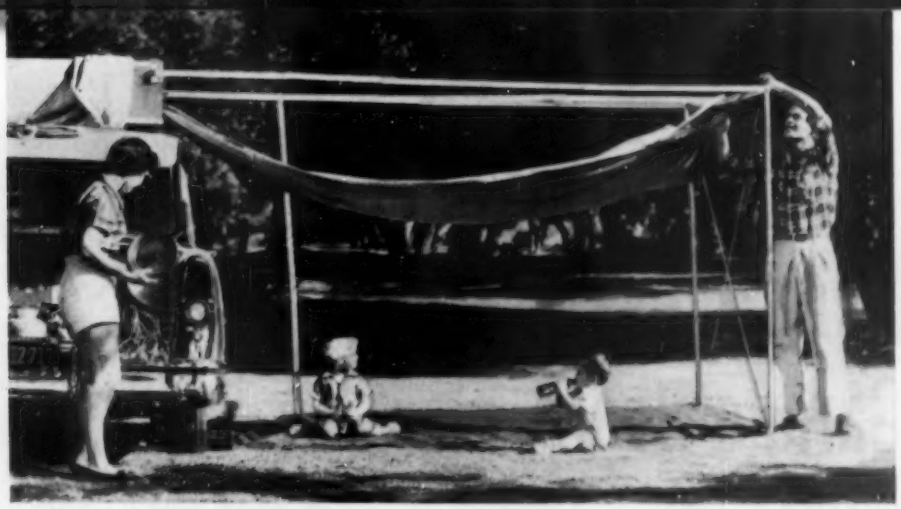
Cautions. Just to satisfy John Law, it's probably a good idea to hang the license plate where it's more or less readable. It's also probably a good idea to check your state's legal restrictions.

The only other problems are backing into trees and keeping tail-hugging drivers from sucking your outboard into their grilles.

If you drive a lot in bad weather, or are plagued by dusty or muddy roads, a worth-while addition would be a canvas cover to cloak the rumble-riding outboard against the elements. END

Enameling Old Surfaces

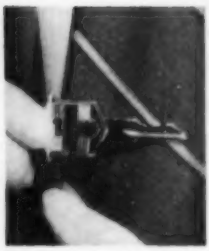
You can prevent cracking, crazing, alligatoring and chipping of enamel put on over an old surface. First clean off all dirt, grease and wax with a strong solution of washing soda, and rinse with clear water. Then sand to cut through the gloss of old enamel, varnish or paint. If an oil gloss paint was used for the old surface, mix a little enamel with the first coat of enamel undercoater.



1. Car Tent Pulls Out. Setting up this 7½-by-10½-foot tent is a matter of a few minutes. You pull it out from the aluminum carrier mounted on the car roof with straps or suction cups. There's room in the case for cots and other equipment.

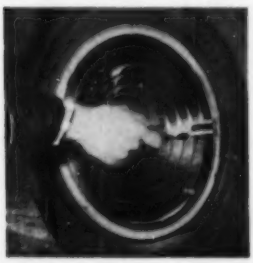
New for Your Car

2. Lighter Puffs on Cigarette. Press the button on this automatic lighter, and you get a light without taking your eyes off the road. It plugs into the regular dashboard lighter socket, and will work on all six-volt cars. No wiring is required.



4. Key Worn on Tie. An emergency car key in the form of a tie clasp will keep you from locking yourself out. Decorated with your car's crest, the key swivels off the tie bar for use when it is needed.

3. Hubcap Tool Prevents Marring. Prongs on this tool remove a hubcap or wheel disk without denting, and you can use the rubber handle as a hammer in replacing them. The tool is also useful for removing front-wheel grease caps, transmission snap rings, door-hinge pins, chrome molding and for household jobs.



5. Garage Buffer Absorbs Bumps. Both garage and car are protected from damage by this spring-steel buffer bolted to the wall with its adjustable crossbar at bumper height. The bar is painted in aluminum to give maximum light reflection.

Further information on these new car products can be obtained from: 1. Kar Kamp Mfg. Co., 11680 McBean St., El Monte, Calif.; 2. Skibby's, 3463 S. 12 St., Milwaukee 15; 3. Presto Mfg. Co., Ltd., 302 Fort St., Winnipeg 1, Can.; 4. Maymac Co., 79 W. Grand St., Mount Vernon, N. Y.; 5. Tuthill Spring Co., 760 W. Polk St., Chicago 7.

Pointers on Building Garage Doors

By Edwin M. Love

YOU can use three basic frames to build just about any kind of overhead garage door you'd like. Faced with inexpensive siding or plywood, they can be styled to match your house or to give it a special touch.

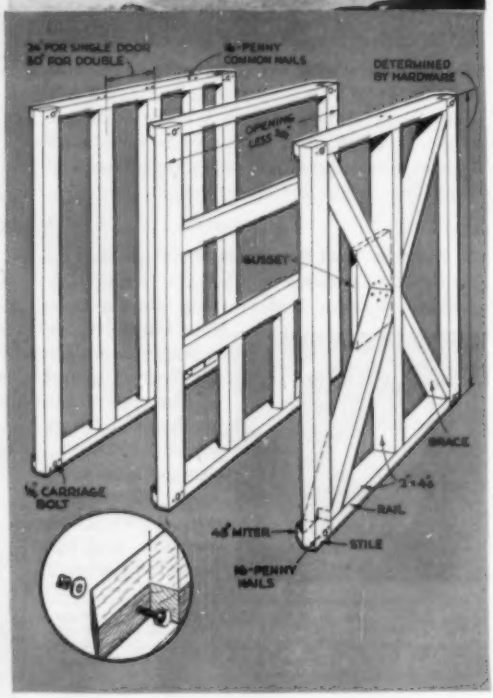
Two-by-four rails, set flatwise at the sides, are notched into stiles at the top and bottom and bolted together at the corners for strength. You can then nail in braces crosswise for vertical boards or run them up and down for horizontal or diagonal ones.

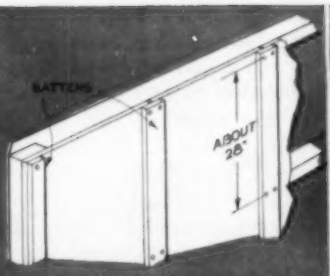
With the split frame, you can run the siding in two directions for a wainscoting effect, or combine siding with plywood. The X-braced frame provides corner supports for nailing on boards in concentric squares or rectangles. Or you can add a window or louver to help break up that bare-face look that many doors have.

Selecting the hardware. Most jamb-type sets require a space of 8" to 13½" from the top of the door to the ceiling. If you haven't this much room, you can get special track sets that need as little as 1½".

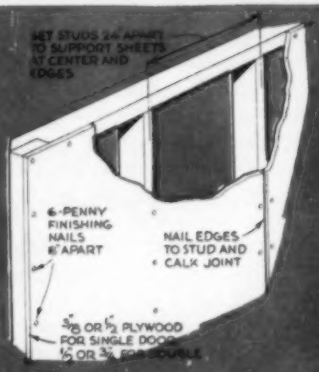
There's also a pivot type that mounts on the side of the garage, but this can't be used where a narrow opening requires it to be set too far out from the wall.

You'll need heavier hardware for a double door than for a single. Most sets come in only two sizes, but for

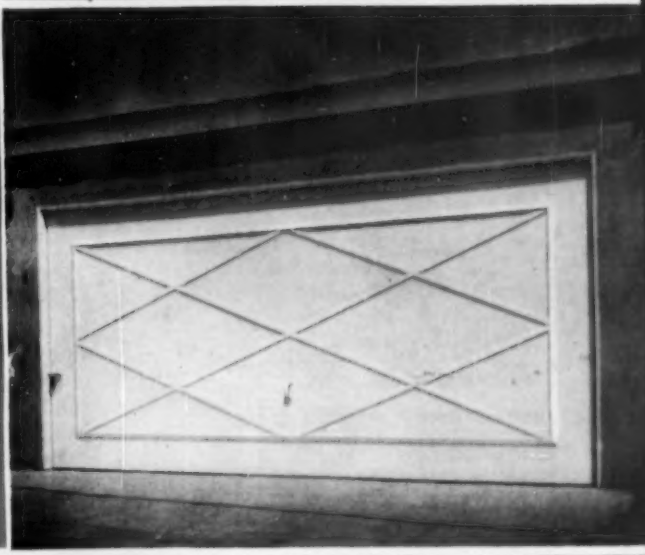




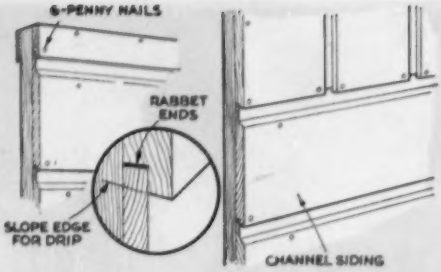
BOARD-AND-BATTEN treatment gives look of vertical paneling, but with less-expensive unmilled lumber. Gap boards ¼" for swelling; cover joints with one-by-two or one-by-three strips.



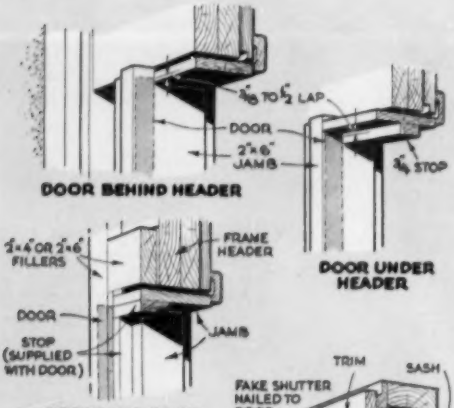
DIAMOND PATTERN of wood molding dresses up a plain door made by nailing plywood sheets over frame. Use cheap sheathing-grade plywood, but patch and fill it well before painting.



SMALL SCRAPS of plywood nailed to door frame and covered with checkerboard pattern of strips save waste. Sketch shows two ways you can notch fancy moldings to fit together.

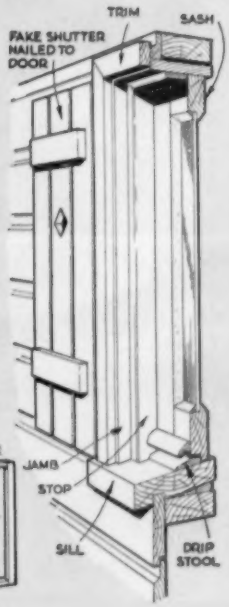


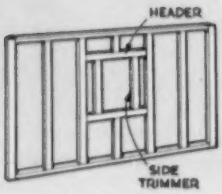
NAIL SIDING TO FRAME for a door that blends with house walls. Countersink and putty over heads to prevent rusting. For wainscot effect at right, rabbet vertical boards over lip of horizontal one below and back up joint with cross brace.



FRAME OPENING as at center above if door mounts behind header, or as at right above if it mounts under. Widen header as at left with sectional door.

TO ADD A WINDOW, buy sash, build separate frame around it, and nail into opening in door. Hinge it inward to avoid breakage or fix sash with strips.





others that are rated according to door weight, you can figure that a single door will run about 200 pounds and a double one twice that.

Framing the opening. All jamb-type and some track-type mechanisms require new 2"-by-6" side jambs to provide a mounting base. You can spike these over the old 1" jambs if space permits, or remove the old ones first. Shim them plumb and cover the gap with new, wider trim.

While the header beam, if level, is sometimes used for the top jamb, it's usually best to nail up a new 1" board. For an inside-lap door, this must be narrower than the side jambs by the thickness of the door, so that the back is flush with the jamb edge.

Laying out your door. The 8' width for a single door is often stretched to 9' to give today's supercars more fender room, but 16' is still popular for a double. If need be, the standard height of 7' can be cut 6" without decapitating your car.

If you're working with an existing garage, take the dimensions directly from the opening after all new framing is in. Allow ¾" clearance at each side of the door and whatever is required at the top by the hardware. Build the door on the floor so you can be sure that all parts lie flat.

Putting on the face. If you use siding, nail it on so that the joints line up with the siding on the garage. If you run it vertically, start at the center and work toward each side so that the edge pieces will come out equal in width.

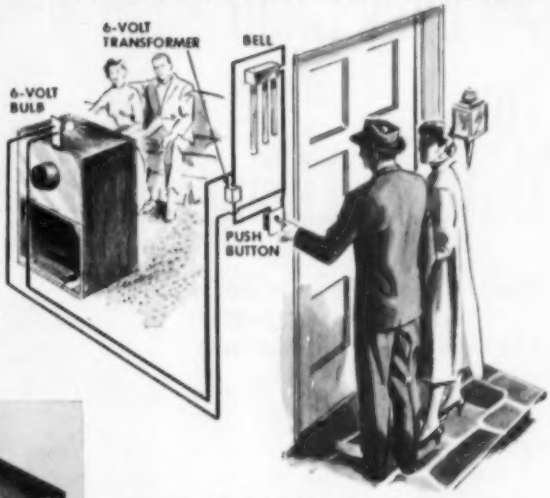
For a plywood facing, run both the frame members and the sheets vertically, making sure that there's a brace at each joint and one at the center of every 4'-wide panel.

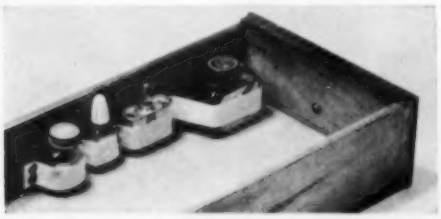
Butt joints will crack and show unless you plan to cover them with moldings or battens. If you want a plain surface, miter the plywood edges at the splices, coat them with waterproof glue, and nail through the laps into the backing frame. END

Signal Light on Television Set Announces Arrival of Guests

HARD to hear the doorbell when you're deep in your favorite video show? Then a bit of bell wire, a small plastic socket and a 6- or 8-volt bulb can solve your problem.

Attach a bracket to the back of the TV set and mount the socket on it just above the cabinet. Attach two lengths of bell wire to the socket and run them around the baseboards to connect with the doorbell circuit. When the doorbell rings, the bulb will light up.—*George P. Stein, Glendale, N. Y.*



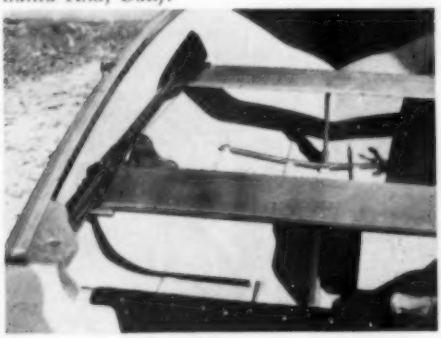


Tape Holds Bottles Upright

SMALL bottles won't tip over in a desk or vanity drawer if you secure them with a length of elastic tape. Press in thumbtacks at intervals to accommodate single bottles. —*Norm Jacky, Fond du Lac, Wis.*

Brackets Keep Oars Off Floor

OARS are out of the way but accessible if you mount an oar bracket on each side of the rear seat. I shaped mine from 1"-by-6"-by-6" hardwood. Face them with a strip of tire casing or rubber shoe sole. Similar strips on a forward seat and inside the transom will prevent chafing.—*Clinton R. Hull, Santa Ana, Calif.*



Tennis Racket Is Table Stand

YOU can use an old tennis racket as a stand for an unusual end table in a den or playroom. Remove the strings and sand off the varnish; then notch a disk of ¾" stock to fit the frame snugly. There's no danger of tipping if you glue the joints and drive in a slender finishing nail.

An 8"-by-9" piece of ¾" veneer plywood makes a sturdy base. Bore to the shorter diameter of the octagonal handle, and rasp to fit. Glue in with or without the shoe. —*Clifton Morris, Albuquerque, N. M.*

An Easy Chair for Outdoor Living

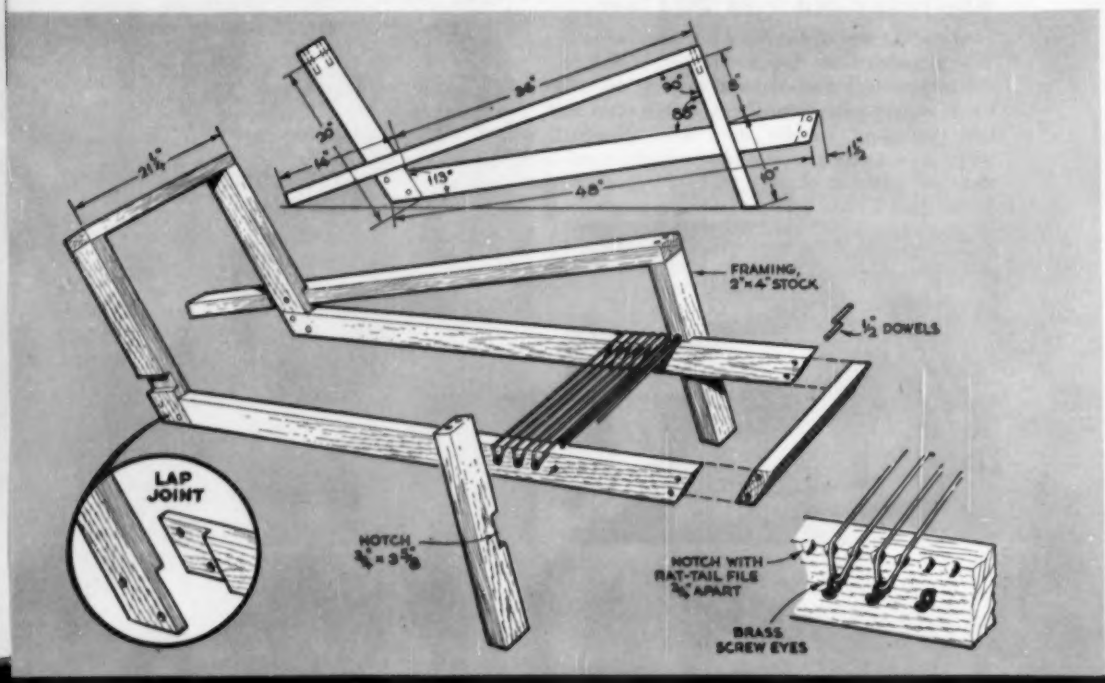
Easy to loaf in and easy to make, you can put it together over a weekend.

THIS surprisingly comfortable outdoor chaise longue is a simple construction of two-by-fours and clothesline. A fast worker might relax in it the same day he actually began the job.

Use selected, vertical-grain pine or fir for the frame. Assemble the back rest and seat frame first, and then the arms and legs.

Note that the front legs and back uprights are notched for mating pieces. Except for these joints, which are fastened with glue and wood screws, all are doweled and glued, with the dowel holes bored from the faces. This makes it easy for you to match holes and produces a pleasing effect of pegged joints. Use waterproof glue. Finish is applied before lacing.

Use high-grade cotton line that has been stretched on pulleys overnight with a bucket of sand for a weight. Knot the end and lace taut through screw eyes. You need about 130′ for the seat and at least 52′ for the back. Lashed shorter lengths may be used if the joined ends are stapled against solid wood to relieve strain.—*Hi Sibley, Nuevo, Calif.*



He's Building a Steam Car

Ray Boss works both ends of the scale: from full-size gas and steam cars down to tiny, incredibly detailed models.

By Harry Walton

OFTEN it's because a thing doesn't look possible that Ray Boss of New London, Conn., tries it. When it's done, he goes on to something equally unlikely, such as a live-steam locomotive in TT gauge.

A serious young chap (he's only 27), Boss has been at it since his early teens. He's a man with two interests, steam cars and miniature models, and, not illogically, he has two workshops. One, in the basement, is for "little

stuff." It has a 10" quick-change lathe, bench milling machine, drill press, jigsaw, grinder and the usual small tools.

His back-yard shop, housed in a 24-by-40-foot building, consists of sterner stuff. Boss built the place of concrete blocks (he did the wiring, too). Big enough to hold several cars, it is outfitted with two lathes (the larger a gap-bed type that swings a 16" faceplate), a factory-size milling machine, drill press, welding equipment, arbor press and heating plant. Here Boss works on cars or other big jobs.

Employed as a skilled assembler at the Electric Boat Company plant, Boss prefers the late-afternoon-to-midnight shift because it gives him more time for his hobbies. He manages about four hours a day in his own shops. With two or three projects always under way, the time goes quickly.

This is one of a series of articles about outstanding home workshops. See POPULAR SCIENCE MONTHLY *next issue for a story on another fellow's shop.*

When Leo Reagan, a prominent local citizen, bought a 1900 Locomobile steamer, he found ordinary garage mechanics unable to cope with its intricate plumbing. After some costly blunders, the job came to Boss.

He took the car apart, repaired defective parts or made new ones, and rebuilt it. He then refinished it expertly, even to pin stripes on the spring leaves.

But what Boss would really like to make is a modern steam car. He feels that such a machine, built with today's superior materials and taking advantage of decades of automobile know-how, should be superior to gasoline cars on several counts. Since Detroit isn't turning out any, Boss is building his own.

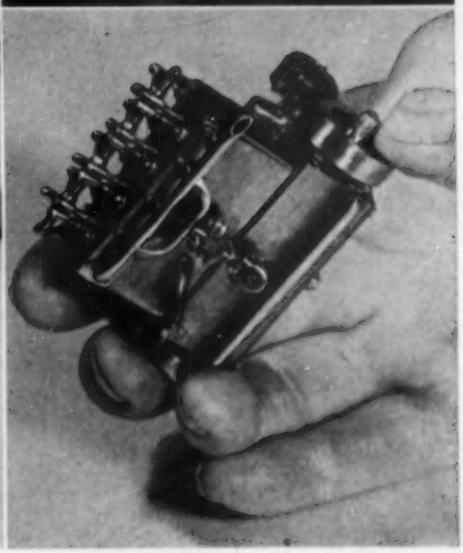
He plans to get a running start by using the frame, wheels and body of a Henry J he has. But he will remove the engine and transmission to install a homemade steam power plant and a monotube steam generator. This he has

GAP-BED LATHE, one of three that Boss uses, has ways that can be slid away from the headstock when extra-large work is to be swung. It was on this that he wound the coils (at bottom of page) for the steam generator he plans to use in a car. A Chrysler auto transmission varies spindle speeds. Boss's hand is on a belt-tightening lever that serves as a clutch to control the lathe.

COILED POWER. Monotube steam generator is designed to convert a Henry J to steam. It consists of eight sections of ⅝" steel tubing, each having two coils wound in opposite directions. With a homemade pump, Boss here applies 2,000 lb. of hydraulic pressure to test the assembly. It has 70 sq. ft. of heating surface, and will be heated by a gun-type burner.

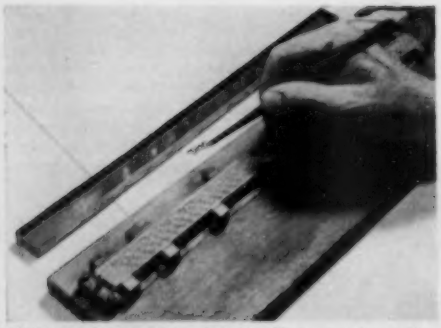
1900 LOCOMOBILE STEAMER was rebuilt and refinished like new by Boss. Its noncondensing power plant is good for about 25 miles on a filling of water. The boiler and two-cylinder engine are under the seat. Controls include a steering bar, throttle, foot brake and valve cut-off. Now that the steam buggy is finished, Boss is making a working model of it.

LIVE-STEAM LOCOMOTIVE has run many scale miles on Boss's O-gauge cellar pike. It was originally fired by an alcohol torch, but is being converted to burn butane gas. The cylinders are ½" bore and have slide valves worked by Walschaert gear. The duplex steam pump (near finger) puts water into the boiler while engine is under steam, so it can make long runs.



MODEL RACING CAR above has a fully sprung front end. An Arden .099-cu.-in. engine is built into the driver's body; brass head unscrews for access to the spark plug. A larger racing car made by Boss has full springing, welded wire wheels and a real carburetor. He runs them in the basement, where they are tethered to a pole by a ball-bearing swivel.

MIDGET GAS ENGINE, a four-cylinder water-cooled type, is ¼" bore and stroke. Pistons are cast iron, with 1/32" hollow wrist pins and bushed rods. The camshaft was filed to shape and case-hardened. Tappets are adjustable. The shaft runs in ball bearings. Spark plugs don't come small enough; Boss made each by turning down 136 mica disks on a metal stem.



LAST-DITCH REALISM. To duplicate antique tire tread for a scale model, Boss cut words NON and SKID—24 of each—from thin brass, then pinned them into a metal tray (in rear above), laid in copper tubing, and poured in type metal. Result is a vulcanizing mold (under hand).

TIRE CARCASS, complete to trademark and tire size in relief, was tooled out of metal and used as the pattern for another type-metal mold. Uncured rubber was clamped into both molds and vulcanized by passing steam through the embedded tubing, forming tread and carcass.

TREAD WAS CEMENTED to carcass to produce the model tire, here shown against the real thing for comparison. Spokes for the car's wire wheels are .030" florist's pins, threaded 112 threads per inch with a homemade die to screw into tapped holes in the metal rims.

already made of stainless-steel tubing. To fire it, Boss plans to use a standard furnace oil burner converted to 12-volt operation. The burner will work into a combustion chamber at the top of the boiler coils, with the "chimney" underneath. He believes it will burn fuel oil, gasoline or kerosene interchangeably.

Two thermostats are to control the burner, one to cut out when coil temperature reaches a certain maximum limit, the other when steam pressure gets up to several hundred pounds. The boiler will be fed with water automatically by an electric pump, requiring no attention.

Boss expects to take a year to build the engine, a pancake four-cylinder type with single-acting cylinders and poppet valves. He will probably use motorcycle barrels and parts of auto engines.

Instead of exhausting steam to the atmosphere (which would require a big water supply and frequent stops for replenishment), the engine will exhaust into a condenser. This will probably be an auto radiator mounted in the usual position in front. As the exhaust steam returns to water, it will produce a vacuum that will boost engine power, and the water will be recirculated to the boiler for further use.

In a gasoline phase, Boss revamped a Crosley Hotshot by installing a Ford engine and transmission, a shortened Ford rear end, Mercury front axle and brakes, MG wheel hubs, and wheels of an Italian make. To facilitate the job, he casually cut the body apart behind the seat and later welded it back together. This automotive hybrid has run 11,000 miles to date.

Working at the other end of the scale, Boss builds superb models in miniature. A current project is a 1"-to-the-foot scale job of the Locomobile he rebuilt. Most modelmakers would be content with tires of plain rubber tubing; a few might turn wooden tires and carve the tread on them. But perhaps only Boss would make them by vulcanizing rubber in homemade steam-heated molds, as shown in the photos on this page.

[*Continued on page 262*]

How to Use Your Dimmer Switch

ON THE CREST OF A HILL or on a turn, the glow of headlights tips you off that a car is coming. It's a refinement of the art of dropping your beam to hit the switch before the other car comes into view.

A "ONE-EYED" DRIVER may not know that one of his lamps is shot. It's a courtesy of the road to flick your own headlights a couple of times to suggest to him that something is wrong.

WHEN HIGH BEAMS BLIND YOU, it's perfectly acceptable to flick your own brights a couple of times to nudge the other guy's memory. But blasting with your own high beam puts you among the fools who use the highways, some of them now dead. You should remember that a blinded driver instinctively pulls away from the edge of the road—into traffic.

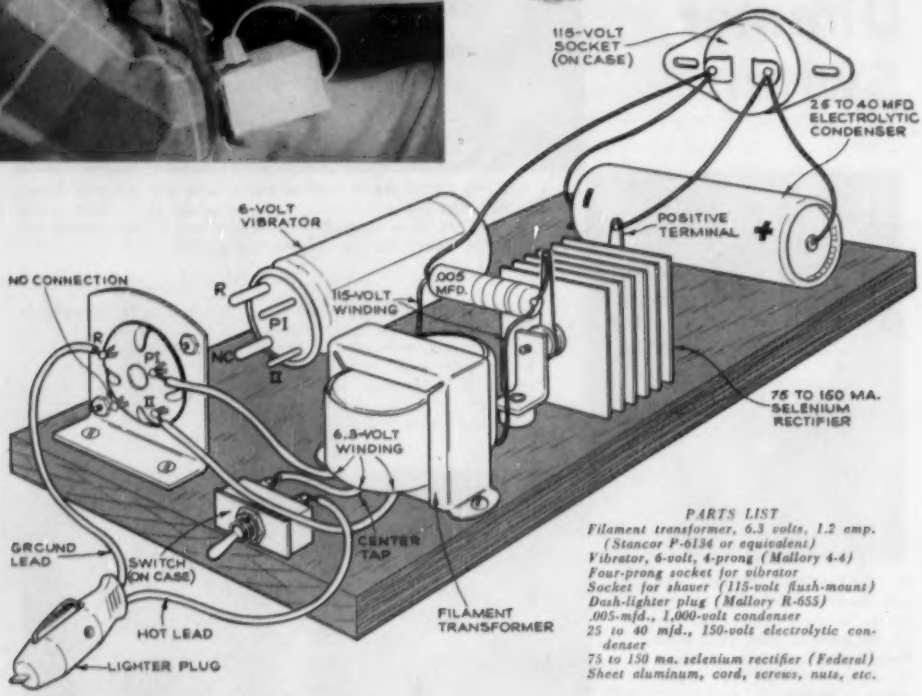
WHILE TRAILING ANOTHER CAR, remember to switch down your beam to take the glare out of his mirror—a courtesy you would certainly appreciate if your positions were reversed. A trailing car's high beams can trouble you even if it's quite a distance behind.

SHOULD YOUR DIMS BURN OUT and you still must drive, turn your lights on and off momentarily to tell an approaching driver that you have troubles—and are not really the dope he may think you are.

READY TO PASS A CAR, flick your lights up and down. Keep them down until you are abreast of him, then kick them to bright. If the other driver is as thoughtful as you, he will kick his down as you cut back in.

Two Ways to Get

A converter lets you run it from an auto's lighter socket.



PARTS LIST

Filament transformer, 6.3 volts, 1.2 amp. (Stancor P-6134 or equivalent)
Vibrator, 6-volt, 4-prong (Mallory 4-4)
Four-prong socket for vibrator
Socket for shaver (115-volt flush-mount)
Dash-lighter plug (Mallory R-655)
.005-mfd., 1,000-volt condenser
25 to 40 mfd., 150-volt electrolytic condenser
75 to 150 ma. selenium rectifier (Federal)
Sheet aluminum, cord, screws, nuts, etc.

ONCE your skin loves the touch of an electric shaver, you may dread using a blade on vacation.

With this midget converter my electric shaver plugs into the car cigarette-lighter socket to whisk away whiskers just as at home.

Parts for it cost less than five bucks. The gadget paid for itself on a five-week camping trip. Now I keep a shaver in the glove compartment to use while my wife drives me to the train. This dodge gives me five minutes' extra sack time.

A small radio filament transformer, connected backwards, boosts the battery potential to about 115 volts. The rectifier converts this back to direct current, and the big filter condenser smooths out the humps in it. Don't omit the little .005-mfd. condenser across the transformer; it reduces arcing in the shaver motor.

I mounted the transformer and condenser on a 4½"-square wood base, with a right-angle bracket to support the condenser. A simple boxlike cover was bent from aluminum to fit the base, with a hole in its top for the shaver socket. Another hole admits the cord from the lighter socket.

Don't plug in and switch on the converter unless the shaver is plugged in. And resist the impulse to take along your TV set or let your wife use an electric iron. The converter is only for flea-power jobs such as shaving your chin.—*Hugh Harvey, Scarsdale, N. Y.*

More from an Electric Shaver

A simple booster-rectifier will pep one up on house current.

GOT an old shaver that's loafing? Or a new one you'd like to see work even better? Feed it direct current and it will shed whiskers up to twice as fast.

Except for those with vibrator-type motors, shavers run on AC or DC. But they run peppier on DC, giving faster, cleaner shaves. This little unit—a one-evening project—supplies DC.

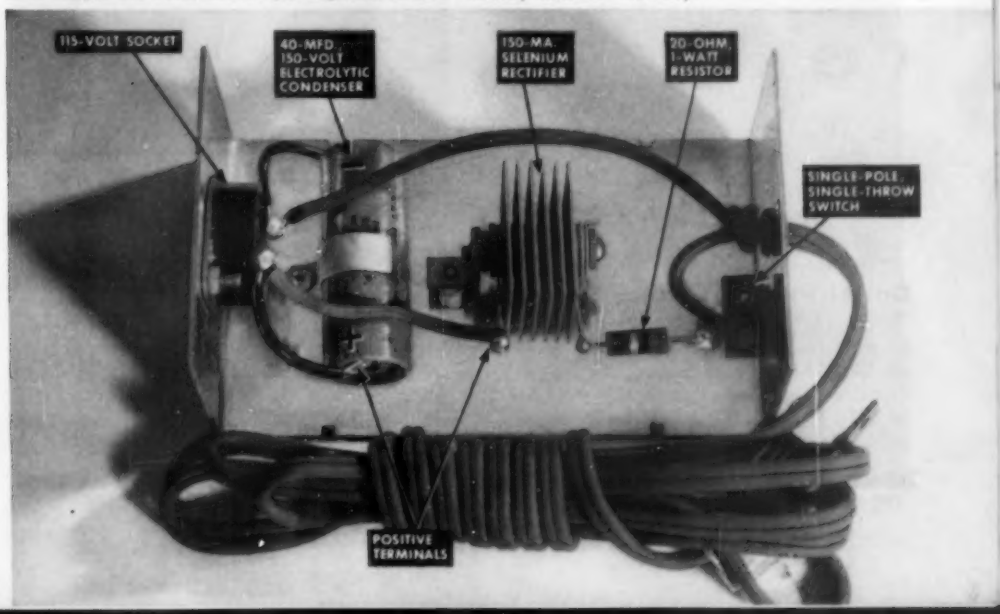
It also provides a voltage boost, so if you live where line voltage is low, it will bring your shaver nearer peak performance. The condenser filtering action quiets much radio interference.

Any radio store has the parts. I made a unit with a 350-ma. selenium rectifier that no longer worked well in a TV set and a 40-mfd. condenser from a radio.

The base can be a board fitted with a cover or a U-shaped box bent from sheet metal. Mount the parts on this as shown in the photo below. Cover with a piece having flanges at right angles to the first. Connect the rectifier with its positive terminal on the same side of the socket as the plus side of the condenser. —*Marion L. Rhodes, Knightstown, Ind.*

LUXURY SHAVING is yours at home, too. This rig boosts voltage, converts house juice to direct current. This gives most shavers new pep, yields a closer shave in less time.

EIGHT CONNECTIONS are all it takes, with parts in your junk box or from a radio shop. Wiring is so simple the outfit can be put together in an evening. But don't try to use it with a shaver having a vibrator instead of a motor. These are usually marked "AC only."



Drawer Under Dash Holds Glove-Compartment Overflow

THERE's room under the dash for maps, sunglasses and the like if your glove compartment is always full of other items.

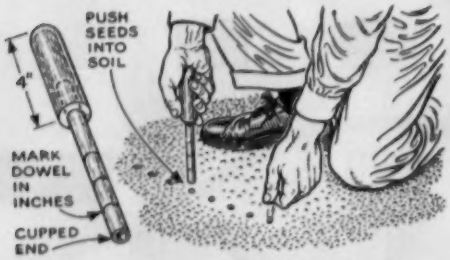
This composition-board drawer rides on wood runners mounted on the radio bracket and held to the dash with self-tapping screws. Assembly is chiefly with cellophane adhesive tape, which also seals the joints.

A slight pitch of the runner grooves toward the front of the car eliminates the need for a catch. The drawer face hides the runners from view and also serves as a stop.—*Tom Root, Plymouth, Ohio.*

Links Help Adjust Tent Rope

SPRINGS used to adjust tent or awning tension are easy to attach to metal stakes if you fit one end with links from an old chain, as at left. Use links that will go over the shank and be held by the head. Twisted wire can be used if you don't have a chain. Swivel pulleys at the other end of the springs are a convenience.—*Clinton R. Hull, Santa Ana, Calif.*

▶▶▶A strong magnet in a cloth bag containing valuables will let you hide them in such unlikely spots as the underside of a sink. Don't include a watch; the magnet may ruin it.—*Andrew Vena, Philadelphia.*



Dowel Planter Gauges Depth

A SHORT dowel, hollowed at one end to keep a seed trapped, makes easy work of planting. Marked in inches, it gauges the depth you push seed into the soil. Set it in a length of broomstick for a handle.—*David W. Deamer, Westerville, Ohio.*

Dado Head Doubles as Jigsaw

YOU can cut perfect circles or outside curves without a jigsaw or bandsaw, if you have a bench saw equipped with a dado-head attachment.

First, you trim the stock close to the line of the desired cut with a number of passes with the regular saw. Then saw to the scribed line with the dado head. The finished edge of the curve will ride on the side of the dado blade, which thus acts as a guide.—*Vern Forsberg, Seattle.*

New Photo Film Has Cat's Eyes

Candle-power portrait

What you can do with the new Tri-X film is dramatically illustrated by the portrait above. It was made by the light of three candles arranged to provide three-point lighting. The actual shooting setup is shown below. The camera was propped up on a book and hand-steadied, the picture taken at an aperture of f/3.5, at 1/10 sec.

Shutterbugs can now click away with only the dimmest peep of light, using sensitive Tri-X.

By George H. Waltz Jr.

WELL, they have finally gone and made a camera film for the dubs. The real dubs, I mean—guys like me who snap the shutter at twilight and then blame the camera or film when they get only blanks.

The new film will forgive almost any photographic sin you can commit. It will take snapshots indoors about as easily

A REFRIGERATOR LIGHT provided the only illumination for this dramatic snapshot, made while the youngster was getting her before-bed snack. The camera was set at f/3.5 and 1/25.

CANDID INDOOR SHOTS are no problem. This one, made in a New York department store on a dull snowy afternoon when there was little daylight, was shot at f/5.6 and 1/50.

as you have been accustomed to taking them outdoors. No flash bulbs. No photofloods. Just shoot.

Daylight coming in the window, or a table lamp or two, provide enough illumination for Kodak's new Tri-X. Snap the shutter. The film does the rest.

"That," remarked my wife, as I set up my camera one evening next to a table lamp, "will never work."

I wondered about it, too. The table lamp was one of those three-way affairs, with a top wattage of 150. I turned it up high. I loaded the camera with Tri-X and seated a friend in a chair next to the lamp. His cheek was 22 inches from the lamp shade. I set up my camera on a tripod three feet from my subject.

Now, get this: it was night. The only other light in the room came from a hanging lamp, also a three-way affair turned up to 150 watts, that was fully 10 feet away. It had a shade that cut its illumination in half.

I cocked the shutter and began shooting. Keeping it at 1/10 second, I tried f/12, then f/22 and then f/8.

I had my film developed at the corner drugstore. It uses run-of-the-mill assembly-line developing and printing. I gave no special instructions other than that I wanted fine-grain development.

A day later I had the results. When I called for my pictures and opened the envelope, I got a pleasant shock. This couldn't be true. All three shots were acceptable—not good by professional standards, perhaps, but good enough for me.

Then I enlisted the help of PSM staff photographer Bill Morris, and, together, we really put Tri-X through its paces. With my lens wide open at f/3.5 and the shutter at 1/25, I shot a dozen daytime pictures of my youngster playing in her room. The only light was the daylight from two windows.

The pictures just about equalled anything I'd ever taken with flash. What's more, the daylight gave a soft and natural effect. There were no deep shadows and no strained expression on my 6½-year-old, who has become quite allergic to having flash bulbs popped off in her face.

From then on we shot just about anything, anywhere, to see what the film could do—daytime, night, indoors, outdoors.

We also tried Tri-X in a moderately priced box-type camera. Under fairly good light conditions indoors, the film yielded exceptional pictures.

For the shutterbug who likes to play

EVEN NEW YORK'S SUBWAY sat for its portrait when the photographer loaded up with Tri-X. Here, his camera set at f/3.5 and 1/25, he got a shot of the turnstiles at 42nd Street.

"YOU CAN'T TAKE SNAPSHOTS IN HERE," said the N.Y. Central employee on the right. "There's not enough light in Grand Central Station." He hadn't heard of Tri-X. Well, here it is.

LIGHT FROM WINDOWS shown, and one off to left, provided the only illumination for this snapshot made at f/5.6 and 1/50. Film's wide latitude helps to counteract exposure errors.

around with portrait lighting, Tri-X has another advantage. Because of its speed, ordinary 150-watt mushroom-shaped reflector bulbs that you can buy for a dollar or so in your hardware store and that last for hundreds of hours can be used for portrait illumination.

With a 150-watt spot and two 150-watt floods, which will cost you a total of $3.30, you can obtain three-point lighting effects. What's more, because of the relatively low level of illumination, the highlights and shadows on the subject are easier to judge and balance, the subject is not subjected to the hot glare of conventional photo bulbs, and you don't have to worry about blowing a fuse because of excessive electrical load on your house wiring.

You don't need a tripod, either. In spite of the relatively low illumination, Tri-X will allow you to shoot at a speed (1/25 or faster) that makes hand-holding your camera possible.

For baby pictures, indoors or out, the new film has the speed that has long been needed. Just shoot. You don't have to worry about the subject moving.

The new film—available in 35 mm., 120 and 620—is rated at ASA 200 for daylight exposure (and that means the daylight coming through your windows when you shoot indoors). That's twice the recommended rating for the older Super XX film. But experience shows that, if anything, the new film is considerably faster than that. Many professionals are setting their light meters at ASA 650, shooting their pictures accordingly, and then developing the film for from 13 to 15 minutes in D-76 developer held at 68° F.

In any case, the film has tremendously wide latitudes both in exposure and development. As a matter of fact, I found that if you rely on your eye to gauge the available light, the tendency is to overexpose rather than underexpose. You can overexpose the film as much as four or five times, however, and still get printable negatives.

Even in bright sunlight the film will provide usable negatives over a wide range of exposures. But an amateur who uses a simple box camera with a fixed exposure of f/11 and a fixed speed of 1/50 will probably play it safer if he switches back to Super XX or Plus X for his outdoor vacation snapshots. The recommended speed with Tri-X for light subjects in bright sunlight is f/22 at 1/100 sec.

Normally, in fast films that have been brought out in the past, any appreciable gain in film speed has meant an equal gain in the graininess of the negatives. In Tri-X, however, the extra graininess is almost negligible.

LOW-COST PORTRAIT LIGHTING is possible with the new fast film. Lights can be inexpensive, long-life 150-watt reflector bulbs. The portrait at left was made with a hand-held camera set at f/8 and 1/50.

BOX-CAMERA PORTRAIT. As shown above, the only illumination for this informal portrait was from two 150-watt bulbs balancing the window light. Yet there was enough light to use a moderately priced box camera.

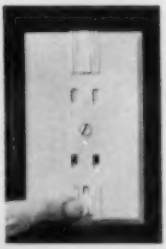
Light from two windows was enough to get this action picture at f/5.6 and 1/50. END

New for the Handy Man

1. Cutter Trims and Edges. Turned on its side, this rotary clipper edges along walks and borders. Flop it on its face and it trims around trees and up against walls and fences (inset). A single nut locks the handle in either position. The blade is mounted on a shock-absorbing hub that gives against obstructions.

Further information about the products described on this and the following page can be obtained from: 1. Hirsh Mfg. Co., P.O. Box 265, Garland, Tex.; 2. Engineered Instruments, Inc., 932 Soto St., Hayward, Calif.; 3. Cable Electric Products, Inc., 234 Doboll St., Providence, R. I.; 4. Arsco American, Inc., 3308 Edson Ave., NYC 69; 5. American Screen Products Co., 807 N.W. 20th St., Miami, Fla.; 6. Portable Electric Tools, Inc., 320 W. 83rd St., Chicago 20; 7. (left) Moto-Mower Co., Richmond, Ind.; (center) McCulloch Motors Corp., 6103 W. Century Blvd., Los Angeles; (right) RPM Mfg. Co., Lamar, Mo.

2. Garage Opener Lights Up. This remote radio control not only swings up your garage door as you approach, but it pops on a light, too. Mounted on the ceiling, it has a ¾-hp. electric motor that operates a drawbar on the door by a chain drive. You can open or close the door manually, overriding the mechanism at any time.



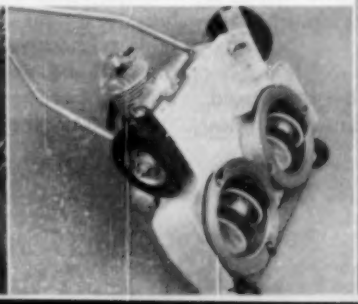
3. Outlet Is Shockproof. Children can't stick their fingers or playthings into this outlet plate. As you pull out a plug, a spring-loaded shield slides across behind the holes, sealing them shut. The plastic plate fits over any standard double outlet.

4. Drawing Stand Fits on a Desk. Screw a board to this aluminum stand and you have a drawing table that tilts or swivels to any position. Rubber-tipped tripod legs protect desk tops. The stand can be taken apart for easy carrying or storing.

5. Kits Build Screens Fast. You can make screens in a few minutes to fit any size windows you want with these kits. Aluminum frame pieces are first sawed to the lengths you need, using a miter box that's supplied with each set. Corner clips are slipped on to hold the pieces together (above)—no special tools are required. Glass-fiber screening is then stretched over the frame and held tight by hammering thin aluminum strips into grooves (at left), and the excess is trimmed off with a razor. Hardware for installing the rustproof, non-staining screens is also included.

6. Drill Sprays Paint. Any ¼" electric drill will power this portable sprayer for paint or insecticides. The compressor, chucked in the drill, exerts air pressures up to 80 lb. It will also inflate auto tires, footballs and play pools.

7. Mowers Do New Tricks. Retractable wheels on the mower at left below lift out of the way so that you can trim up to borders without digging into soft soil or striking obstructions. Either front wheel can be moved independently, or both can be raised or lowered to adjust cutting height from 1" to 3". The twin cutters on the mower at center below have their own wheels set inside them to keep the blades at an exact height, preventing uneven mowing or scalping. Storing the mower at right is easy with a new pivoted handle that lets you hang it flat against a wall.

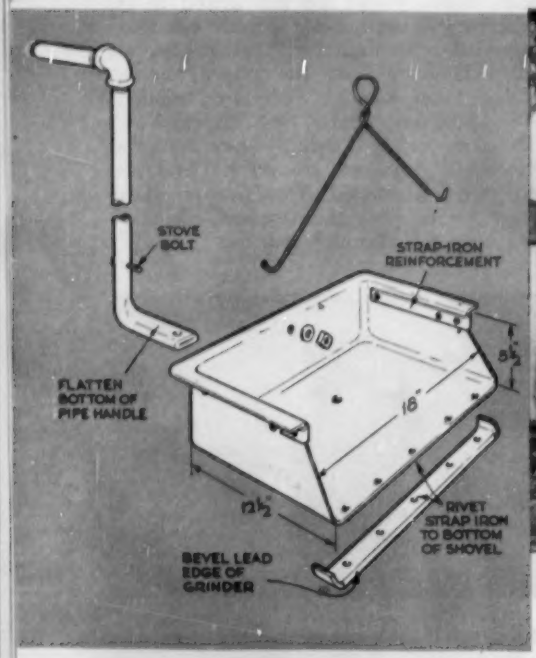


Building Attachments for a

Look in your scrap bin. Maybe you'll find most of the parts for these rugged garden tools.

By Barney Slawson

THESE sturdy garden-tractor attachments won't scrape the bottom of your pocketbook. Most of the parts are probably no farther away than your metal scrap bin—castoffs like half-inch pipe nipples, elbows and tees, a bicycle



OPERATING THE SHOVEL is fun. It is filled by lifting slightly on the shovel handle. This tilts the cutting edge into the ground—and up comes the dirt, with the greatest of ease.

Power Shovel

BEHIND a 2½-hp. tractor this power shovel does an impressive job of ditching and snow- and earth-moving It will scoop up almost a cubic foot at a time, and it dumps its load almost automatically.

The main part of the shovel is a five-gallon stove-oil tank of the type used in many interior installations. Its one-piece back- and side-wall stamping is a natural for conversion, but a similar scoop could be formed from flat stock, bent and riveted to shape.

If you use a stove-oil tank, remove one of the long sides with a hacksaw. Make the cuts through the side walls on a slight diagonal, as shown in the drawing. Next, cut out the flat face of the tank, without removing the heavy flange that attaches it to the press-formed section.

Reinforce the lip of the shovel with

Garden Tractor

fork and a five-gallon stove-oil tank. The only items bought for the shovel, cultivator and dozer blade shown at the right were a four-foot length of chain with swivel clips, a set of sweeps, a pair of strap hinges and a few bolts and rivets.

POWER SHOVEL

CULTIVATOR

DOZER BLADE

TO HAUL THE LOAD AWAY, the handle of the tractor is simply lifted, raising the plow beam and the attached yoke. This oil-tank shovel holds almost a cubic foot of earth.

UP AND OVER goes the shovel when the tractor handle is pressed down, dumping the dirt where it's wanted. With room to turn the tractor, it loads and unloads on the fly.

an 18″ length of strap iron whose cutting edge has been beveled on a grinder, or with a file. Attach it with ¼″ rivets. Use similar strap-iron sections to reinforce the shovel sides where the tongue of the shovel passes through them.

Shape the tongue from a 3′ length of ⅜″ rod. Twist a large loop at its center so it can be fastened to the tractor's plow beam with a half-twist clevis.

For the handle use a 27″ piece of ½″ water pipe. Hammer the lower half-foot flat and angle it over to fit under the shovel. Rivet it in place and drill a hole through the pipe and the back of the shovel just below the flange to take a short stove bolt. Attach an elbow to the upright pipe and thread a 6″ pipe nipple to the other end for use as a handgrip.

The three simple operations used to fill, transport and dump the shovel are shown in the photos above. Unless you are using the scoop as a snowplow, leave the colter on the plow beam, to stabilize the load.

Please turn the page for more tractor attachments

Cultivator

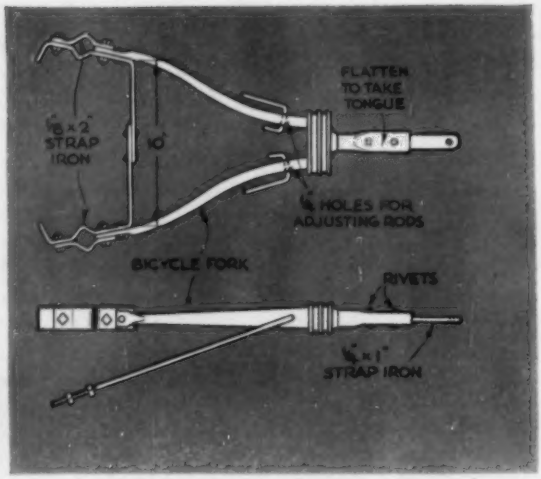
WITH an old bicycle fork, some strap iron and a few pipe fittings, you can be breaking ground with this sturdy cultivator a few hours after you start construction.

Begin by cutting a 12″ tongue from ¼″-by-1″ strap iron. Then flatten the upper end of the bicycle fork's handle-bar tube. When the tongue will just fit into the resulting sleeve, drive it a few inches into the tube and secure it with rivets.

Mark the location for the kingpin hole on the tongue. With the hole drilled and the pin in place, the fork should engage the frame plate on the tractor when it is held horizontally. If it does not, bend the tongue to make the necessary adjustment.

Uncouple the tongue again and clamp one leg of the fork in a vise, putting the bite about 1″ below the fork arch. Bend the leg outward by pulling on the handle-bar tube and tongue. Bend the other leg until the two ends of the symmetrically curved members are 10″ apart.

From ¼″-by-2″ strap iron cut two 14″ lengths and two 3″ lengths. Clamp the 14″ pieces together and, starting ½″ from one end, drill four ¼″ holes through them at ½″ centers. These holes will be used to adjust the width of the cultivator.



Now, separate the strips and bend them to the contours shown in the upper drawing above. Bend the 3″ strips to form the outer sections of the clamps that will grip the sweep holders.

To assemble the frame, bolt the two long sections of strap iron together through holes that give them a spread of 10″. Spring the ends of the fork over them and line up the axle holes (or slots) of the fork with the forward clamp holes. Position the short clamp sections and bolt all of the pieces together. Then drill

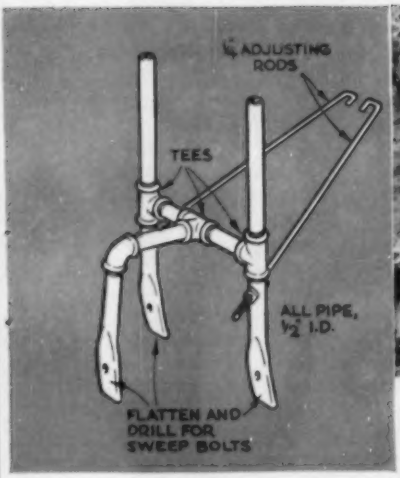
Dozer Blade

HANDY for leveling rough spots in gardens and lawns, and back-filling small trenches, this dozer blade can be made in an hour.

Use a 30″ length of two-by-eight for the blade. Cut a slightly angled recess along its leading edge to take a length of strap iron 1½″ wide. Bevel the bottom edge of the strap iron and drill and countersink holes for the flathead screws that attach it to the wood.

Two 6″ strap hinges form a hanger to suspend the blade from the tractor's plow beam. Fasten the hinges to the top of the blade, back to back and the width of the plow beam apart. Bore aligning holes in the free ends of the hinges for a ⅜″ bolt which completes the hanger assembly. Finally, drill a hole near each end of the blade just above the strap iron and insert eyebolts.

To adjust the blade to the cross-angle and pitch needed for any particular dozing job, use a 4′ length of chain with a clip at each end. Wrap the center of the chain around the clamp that holds the colter to the plow beam. When the right amount of linkage has been taken up on both sides of the clamp, attach the clips to the eyebolts.



CULTIVATOR IS COMPLETELY ADJUSTABLE. The pitch of all three sweeps is controlled by the two diagonal rods. The rear shovel holder may, in addition, be set independently. The sweep spread is quickly increased by realigning the cross-frame holes and inserting longer pipe nipples in the holder.

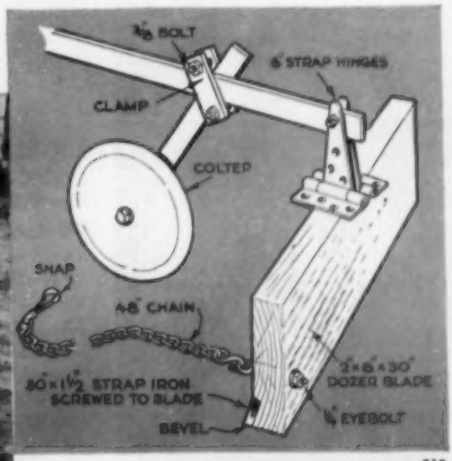
another pair of holes through the fork sides and the long strap sections just ahead of the clamps. Bolts passed through these holes will hold the fork and strap-iron parts in rigid alignment.

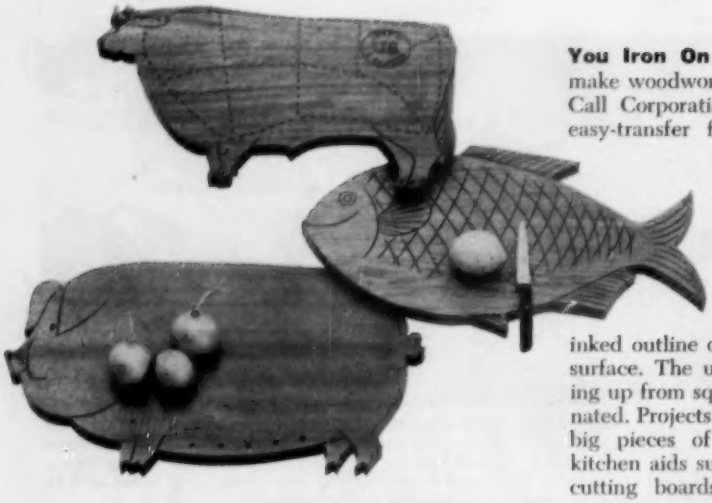
The sweep holder is a simple, H-shaped assembly of ½" piping and tees, with a third tee cut into the center of the cross member to support a trailing shovel holder made from two pipe nipples and an elbow. Flatten the lower ends of the vertical pipe sections and drill holes in them for the sweep bolts.

Two lengths of drill rod control the pitch of the sweeps. These are passed through holes drilled through the outer sweep holders just below the tees, then angled over and sprung through holes in the legs of the fork, about an inch behind the fork arch. Cleat the forward ends of the rods to hold them in place, and thread the sections of the rods that project behind the sweep holders to take adjusting nuts.

With the shovels adjusted to a depth that lets them clear the ground when the tractor handles are raised, your cultivator is ready to roll.

REAR-MOUNTED DOZER BLADE wipes out tractor tracks and makes control easy. See how the weight of the load pulls the wheels into the ground to give them maximum traction.





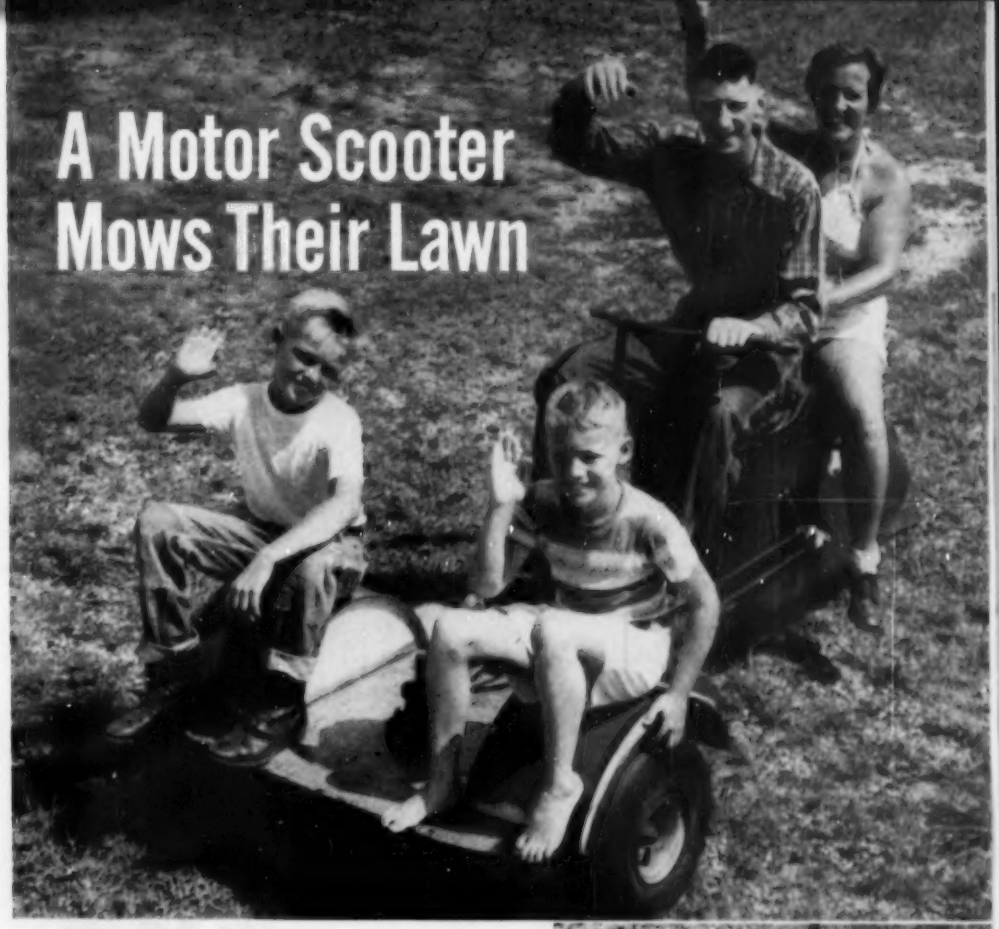
You Iron On the Patterns. To make woodworking easier, the McCall Corporation has adapted the easy-transfer feature of its dress patterns for use on wood in the home workshop. A medium-hot iron is run over a full-size pattern placed on the wood. This leaves an easy-to-follow inked outline of the pattern on the surface. The usual tracing or scaling up from squares are both eliminated. Projects available range from big pieces of furniture to small kitchen aids such as the decorative cutting boards shown here. The patterns are available from McCall's Patterns, 230 Park Ave., New York, and many stores throughout the United States.

What's New in Patterns

Furniture by Top Designers. Want to build your own modern furniture? You can use plans created by six of the country's leading designers—among them Russell Wright, whose drop-leaf table cart you see at right. Designers of other pieces are Peter Hunt, a decorated chest; Freda Diamond, a drop-leaf coffee table; George Nelson, a storage wall; William Pahlmann, a room divider; and Edward Wormley, a screen-bar. Sponsored by U.S. Plywood Corp., plans and instructions are available at lumberyards and power-tool stores.

Patterns for Decorations. Homeowners who have plywood interior walls can use new full-size patterns to rout pictures right into the wall surface. The decorations can also be applied to doors (left), furniture, screens, wall plaques, built-ins and other furnishings. The patterns are traced directly on the surface. You then etch out the design with an electric routing tool. Patterns and instructions are supplied by the Easi-Bild Pattern Co., Pleasantville, N. Y. Both modern and traditional designs are available.

A Motor Scooter Mows Their Lawn

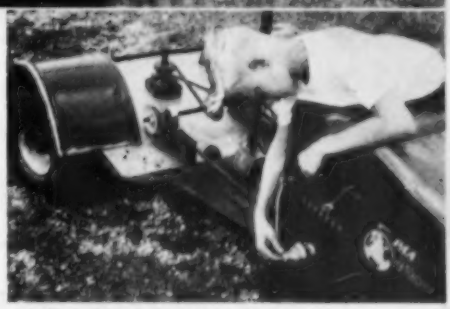


It covers the ground at a fast clip— and never lacks for volunteer drivers.

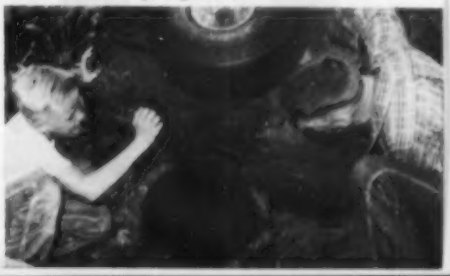
WITH his three acres of submarginal wild-grass lawn taking regular toll of his power mower, Bill Truxall built a tougher one from an airport motor scooter. At 10 m.p.h. it takes two hours to do a job that took the conventional model all day. It's simple enough to be run by his wife or sons.

A Pan American industrial engineer at Miami, Bill bought an old three-wheel scooter for $71. For roughly $20 more he obtained from hardware and auto-parts stores, machine shops and junk yards the necessary parts for converting.

He replaced the delivery body with a sheet of boiler plate, and mounted two pillow blocks in the center for a bearing. On the bottom he hung a cutting blade made from the sharpened leaf of an auto spring, and connected its shaft by pulleys and V belts to the drive shaft which he extended from under the seat. Then he added a pulley and a shaft clutch. *—Jim Martenhoff, Kendall, Fla.*

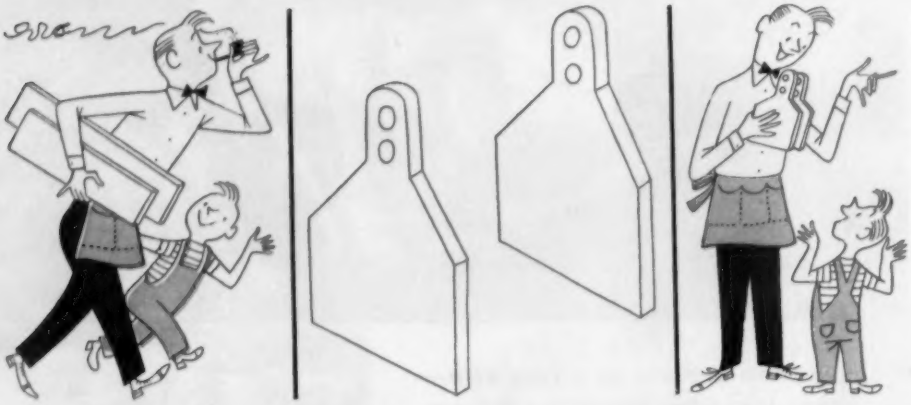


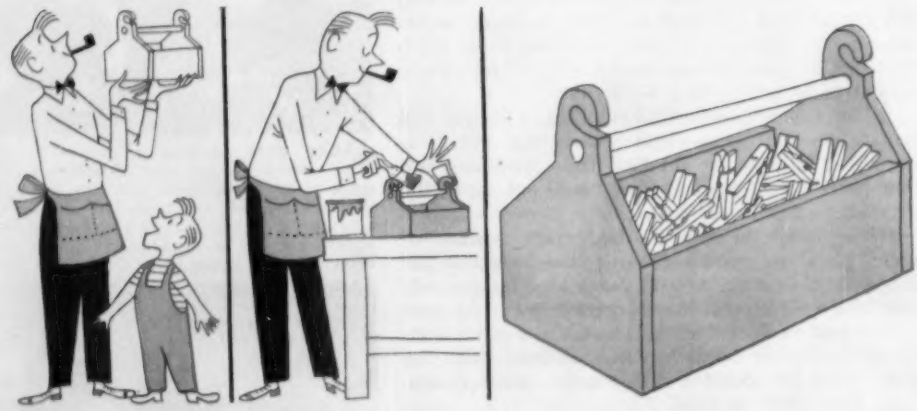
LUXURY ITEM on scooter mower is shaft clutch (top) that disengages drive to blade. Guards over this and the forward belt are a needed safety measure. Business end of the mower is 30" cutting blade (below) made from old auto-spring leaf.



By Roy Doty and G. D. Lynch

Wordless Workshop





Next Month: A tip-proof holder to safeguard flowerpots

Want to hunt uranium? The Atomic Energy Commission developed the circuit for this new

Super Geiger Counter

By Howard G. McEntee

URANIUM is the magic word that has already put more than one amateur prospector into a high tax bracket. But to find radioactive treasure, you need a good radiation counter.

Really hot counters start with price tags of a few hundred dollars. Not having struck it rich yet, I wondered if I could build one myself. To find out, I went to the U.S. Atomic Energy Commission's Health and Safety Laboratory at the New York Operations Office.

Tube nets one percent. Any single Geiger tube, the experts told me, is only about 1% efficient—99% of the gamma rays go through it. To make up for this, Instruments Branch Chief Harris Le Vine has worked out a neat trick—using six Geiger tubes in parallel, which snare roughly 6% of the rays. I was assured the original breadboard rig could be made up as a field instrument.

Furthermore, the six tubes would give calibrated readings, enabling the user to assay his find. Properly built, I was told, the six-tube instrument would approach the sensitivity of at least the lower-priced ($300-$400) scintillation counters. However, you can build the outfit with only two Geiger tubes, and add more later.

Meter averages counts. Each gamma ray triggers a Geiger tube so that it momentarily conducts current, causing a click in earphones or a flicker on a

HERE'S THE AEC JOB. This original breadboard layout, built by the AEC's Health and Safety Laboratory, has six Geiger tubes tied into a bundle which was held with rubber bands. Since 99% of the gamma rays go right through any one tube, the inside tube still gets a crack at them. Although entirely different in layout, the self-contained field instrument shown at the right closely duplicates the performance of the laboratory setup.

THREE METER RANGES are provided, full-scale readings indicating .3, .1 or .03 milliroentgens per hour. Meter is always set to .2 ma. before testing a sample. In the .3 range, the .5% uranium sample reads about .28 ma. The 1%, 2% and 4% samples read .38, .55 and 1.0 ma. On the .1 range, readings are .37, .6, .35 and .52 ma., the last two with sample 3" from bottom of the case. Do not cut a hole in this; the gamma rays will readily pass through.

You Can Build

URANIUM FEVER is in the air. Your favorite camp spot, fishing grounds or summer homesite could be a modern El Dorado. This six-tube instrument not only spots radioactivity, but measures it.

meter. Trouble is, phone clicks are hard to count, while a meter may swing so fast over a "hot" find that you can't read it. If you "damp" the meter—slow down its response—single counts may be so far apart that you don't get a true reading.

But with several tubes ganged, counts follow each other so closely that a damped meter quickly reaches a true value. The needle averages up the counts. Therefore Mr. Le Vine calls this multiple-tube rig a Geiger Integrator.

Redesigned for field use, the unit I built cost about $180 for parts. A kit is now available for somewhat less.*

Batteries are cheap. All Geiger outfits require high voltage. In this instrument it is provided by two flashlight cells working a compact vibrator unit. The

**Federated Purchaser, 66 Dey St., NYC.*

cells should last about 100 hours; new ones cost 30 cents.

There are three other batteries, of the mercury type, which cost under $5 in all. Two have about the same life; the third (B4) will last up to 400 hours.

Meter versus phones. If you prefer, you can hook a pair of high-impedance phones across resistor R14 (it may help to short out the meter and disconnect the damping condenser C12).

But with a meter the instrument can be calibrated. The switch positions give three sensitivity ranges, calibrated in milliroentgens per hour. These .3, .1 and .03 mr/hr. values apply when the meter needle goes from its preset base of .2 ma. to full scale, or 1.0 ma.

Seal against moisture. Since high-voltage equipment is vulnerable to dampness, I built it into a seamless case with a well-fitting cover. Be sure to:

- Fit the cover with a rubber gasket. I used ⅛" sponge rubber, held with heavy-duty rubber cement.
- Use a rubber washer under the head of every screw that goes through case or cover; mine are 1/32" firm rubber.
- Put gaskets of the same material under both ends of the handle.
- Moistureproof the controls as shown.
- Seal the meter peep-hole with a sheet of acetate cemented to the underside of the cover. The meter-mount screws pass through the plastic and help hold it. Spacing washers enable the zero-set screw to clear the plastic.

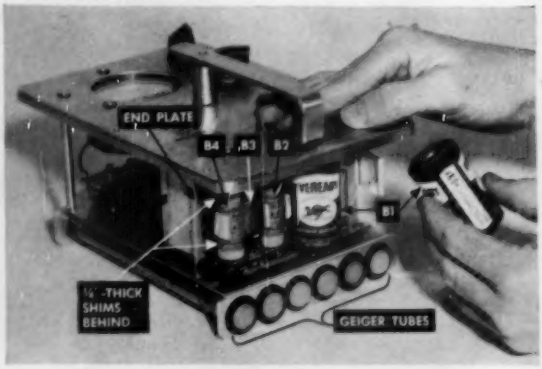
Shape parts from aluminum. Use 1/16" sheet aluminum for the subpanel and end bracket. The former holds the Geiger tubes; the bracket is used to attach the subpanel to the cover at one end, and to mount the power-supply and battery cases.

The holes for the Geiger tubes and their sockets are best made with chassis punches; it is difficult to make clean holes of this size with an ordinary twist drill. Another method is to drill a circle of small holes around, chisel through between them, and file smooth.

At one end the Geiger tubes fit into three-prong sockets; at the other they lie in rubber grommets (you may have

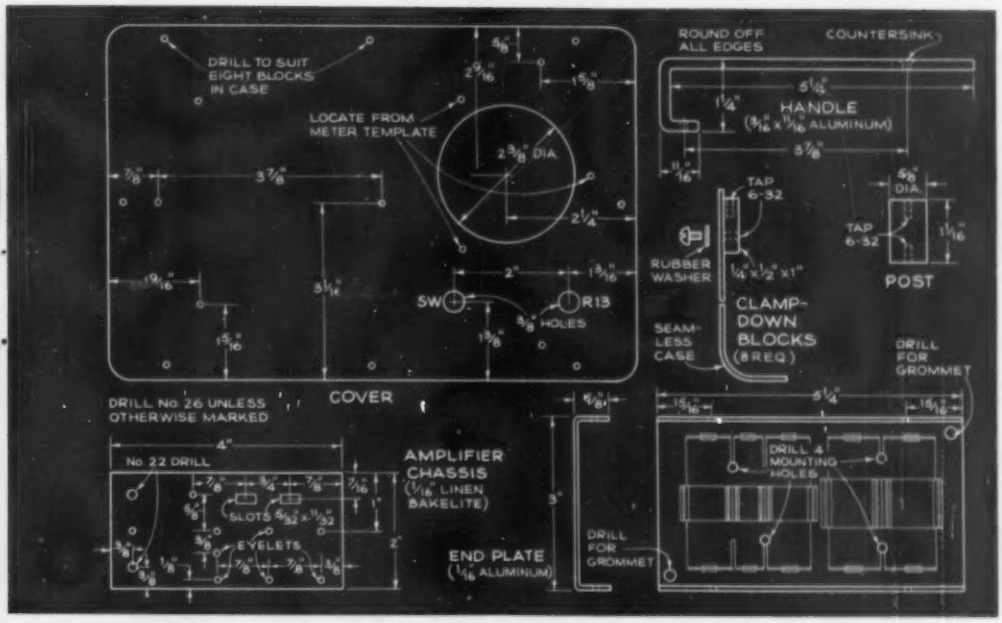
All equipment is mounted on lid of seamless aluminum case

MOUNT THREADED BLOCKS in the case with screws and rubber washers. Drill bolt holes in the cover; then mark through them to spot the matching ones to be tapped in the blocks. Spot battery holders on end plate and drill for 2-56 bolts, which hold power case on the other side. Wire so that all batteries go in positive end up; check polarity of the mercury batteries by the markings on their cases.



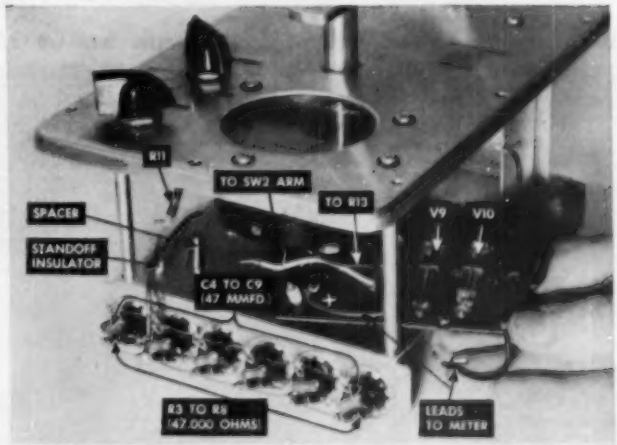
PARTS LIST

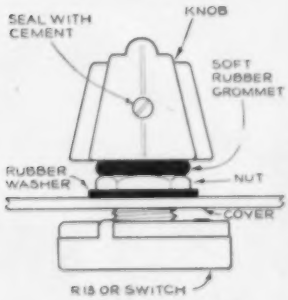
V1: Raytheon CK1036
V2: Raytheon CK1037
V3-V8: Anton 310 (Anton Electronics Lab., 1226 Flushing Ave., Brooklyn, N. Y.
V9, V10: Raytheon CK5886
4 Subminiature 5-prong sockets, rings (Cinch 2H5)
6 3-prong sockets, rings (Amphenol 78-S3S)
Vibratron E1017 (Edko Electronics, 202 Grand St., Brooklyn 11, N. Y.
SW1-SW4: 4-pole, 5-position rotary switch (Centralab)
O-1 ma. 3" round meter (Triplett 321T)
C1, C12: 100-mfd., 6-v. electrolytic (C-D BBR)
C2: .001-mfd., 600-v. disk ceramic (CRL-DD102)
C3: .05-mfd., 1,600-v. (Mallory Plascap PT1615)
C4-C9: 47 mmfd. ceramic (CRL D6-470)
C10: .25 mfd., 200-v. paper Aerovox P-282
C11: .1 mfd. 200-v. paper Aerovox P-282
R1: 18-ohm ½-watt carbon
R2: 10-meg. ½-watt carbon
R3-R8: 47,000-ohm, ½-watt
R9: 3.9-meg. ½-watt, 5%
R10: 11-meg. ½-watt, 5%
R11: .5-meg. ½-watt, 5%
R12: 16-meg. ½-watt, 5%
R13: 3,000-ohm variable resistor (IRC Q11-112)
R14: 1,500-ohm, ½-watt
1 Battery case (Acme No. 12)
1 Battery case (Acme No. 15)
6 Rubber grommets, ⅝" hole
2 Small bar knobs
4¼"-6"-9" seamless aluminum case and cover (Zero Mfg. Co., Burbank, Calif.)
1¾"-2 9/16"-4¾" seamless case and cover (Zero)
2 Teflon standoff terminals (Sealectro ST-1000)
3 Teflon feed-through terminals (Sealectro FT-1000)
B1: 2 "D" flashlight cells
B2, B4: 9.4-v. mercury batteries (Mallory 302437)
B3: 1.4-v. (Mallory RM502R)
Misc: aluminum or dural, 1/16" sheet, ½-¾" bar, ¼" rod; panel decals; 6-32 screws; ¼" o.d. bushings; lugs; wire; rubber for gaskets, washers; 3½"-sq. clear 1/32" acetate; 1/16" linen Bakelite
Counter calibration samples, $10 postpaid (AEC, Box 150, New Brunswick, N.J.)
Tracerlab R-20 radium button ($3.50; Tracerlab, Inc., 130 High St., Boston 10)



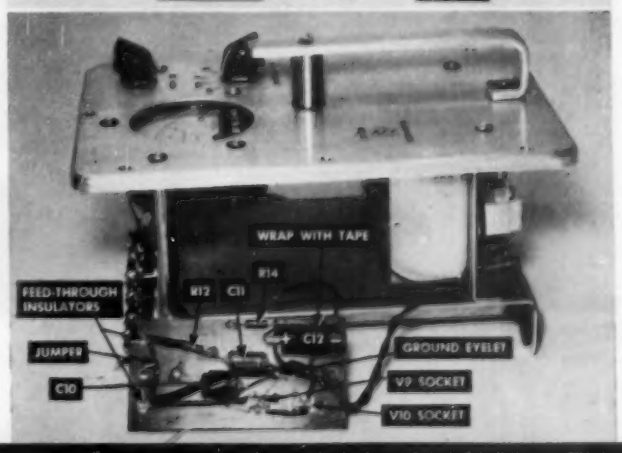
Two-tube amplifier to boost pulses is wired as separate unit

LAY OUT DIAL HOLE and holes for mounting the meter from the template provided with it. The big opening can be made with a fly cutter, hole saw or jeweler's saw. Compact amplifier is wired up on its own chassis and mounted on the subpanel by means of two bolts and ¼" o.d. bushings. Tubes are secured by an aluminum strap bracket (not shown) padded with sponge rubber beneath. This strap is held under the chassis mounting screw.

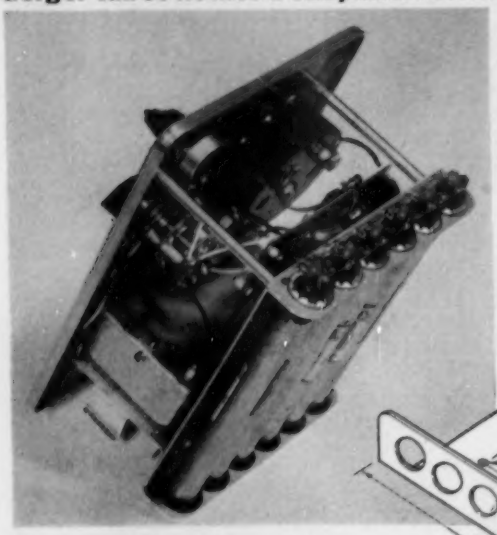




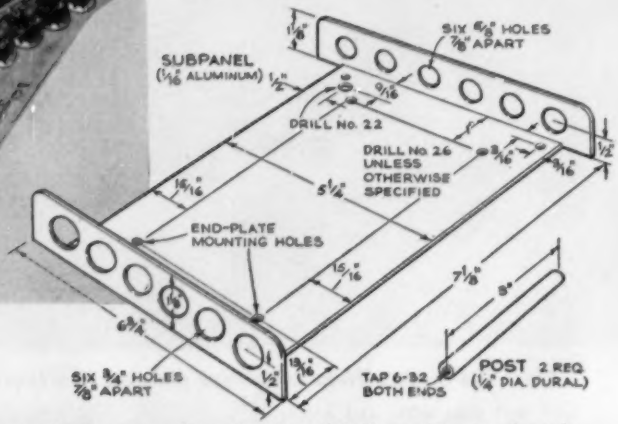
MOISTUREPROOF the controls by clamping a rubber washer under each hex nut and a soft rubber grommet below each knob. Lubricate with glycerin. Right, amplifier from beneath.



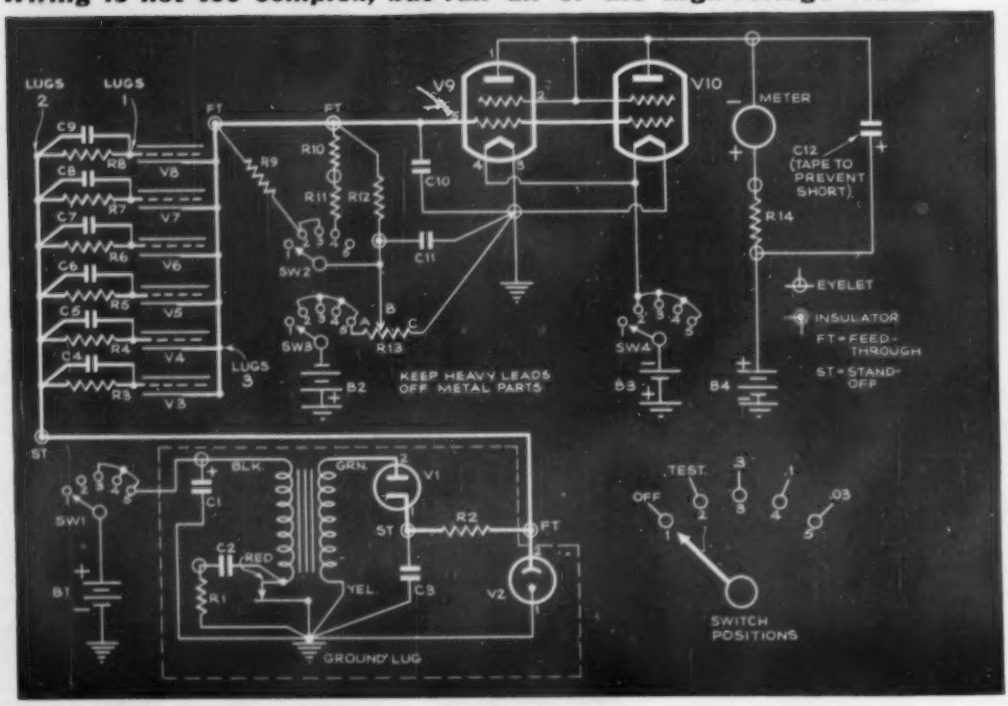
Geiger tubes fit into a subpanel fastened to the cover



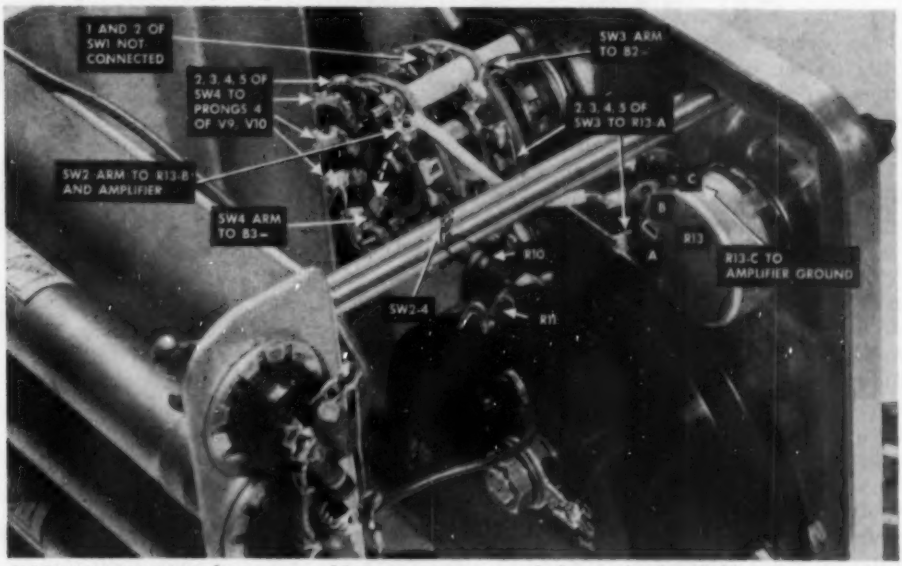
MOUNT GEIGER SOCKETS with spring rings. Bend all No. 3 lugs 90°, No. 1 lugs slightly less. No. 2 lugs have no tube connection but serve as tie points. Solder a 47-mmfd. condenser and a 47,000-ohm resistor across lugs 1 and 2 of each socket. Connect all lugs 2 with bare wire and run an insulated lead to the subpanel insulator. Join lugs 3 similarly and to feed-through insulator on amplifier.



Wiring is not too complex, but run all of the high-voltage leads

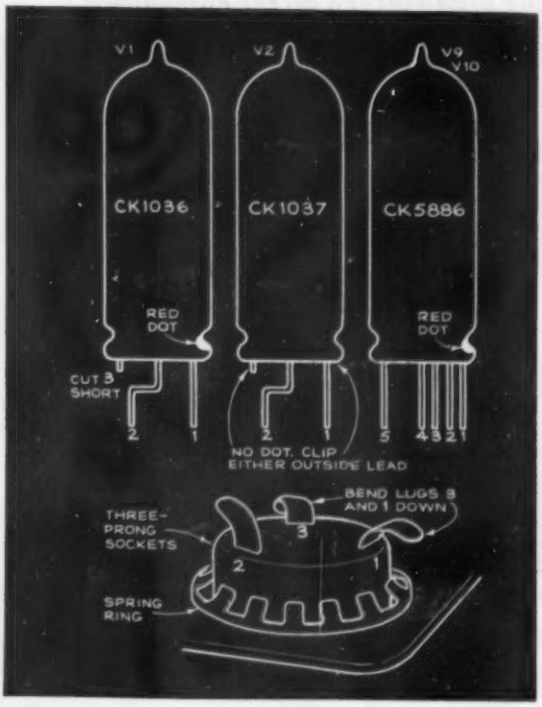


A single rotary gang switch handles four circuits



CLOSE-UP OF SWITCH shows some of its connections. Arm lugs (represented in diagram by arrows) are first ones clockwise, as seen from rear, of the studs that hold switch together. Lugs 5, 4, 3, 2 and 1 follow clockwise in that order. Geiger-tube socket can be seen at left.

with care to prevent leakage



to enlarge the hole in these). The grommets should touch only the plastic tube ends, not the shells, which are at high voltage. Bend the flanged subpanel ends exactly 7⅛″ apart inside; if it's shorter, the shells may touch the grommets.

Cut the clips of the small battery case shorter and reshape them to grip the mercury batteries. To center these on the contacts, mount ⅛″ composition shims behind with 2-56 case nuts.

High voltage in a box. The power supply is built onto the cover of its case, which has a piece of sponge rubber cemented inside it to press against the tubes.

The vibrator-transformer is held with three long screws. Two small angle brackets attached to the transformer hold one end of the Bakelite chassis; a ¾″-long bushing supports the other.

Two chassis eyelets provide soldering points to which several components can be tied. Attach one end of C3 to the standoff insulator, which will take the strain of this off the socket lug.

The Teflon insulators are pressed in-

to No. 22 holes. All leads in heavy lines on the diagram are at high potential and should be kept away from chassis metal. A lug on the cover provides a ground connection; do not depend on metal contact to provide a common ground, but run ground wires between units.

Only two leads of V1 and V2 are used. Clip the third short as in the drawing and pull out all but the two end socket lugs. Be sure to cement the sponge-rubber pad where it will touch the glass, not the tube leads, to avoid leakage.

Using fewer tubes. Even with only two Geiger tubes, you will have an instrument as good as many commercial ones. To retain the same calibration, resistors R9 to R12 should be three times the listed value. Full-scale readings will then still indicate .3, .1 and .03 mr/hr., but of course the instrument will not be as sensitive.

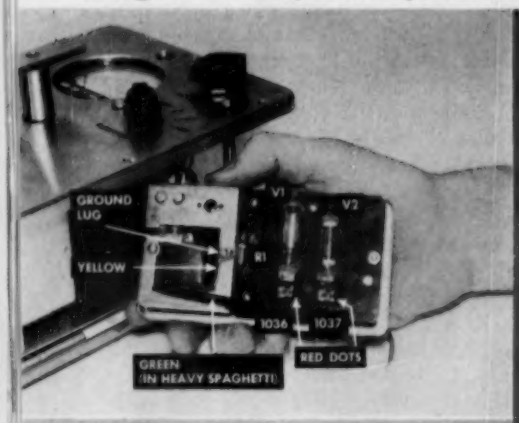
Caution—hot juice! The little power pack really puts out high voltage, so before touching the Geiger tubes or other "hot" parts, always discharge the filter condenser by shorting the power-case insulator to the chassis.

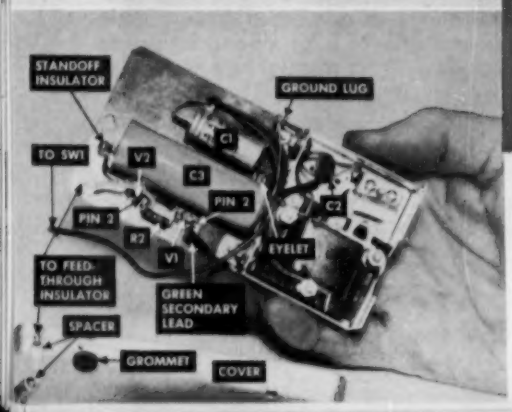
Testing the outfit. Install batteries B3, B2 and B4, switch to "Test," and see if you can make the meter read .2 ma. by turning R13. (It will jump momentarily as you switch on, but should soon drop back.)

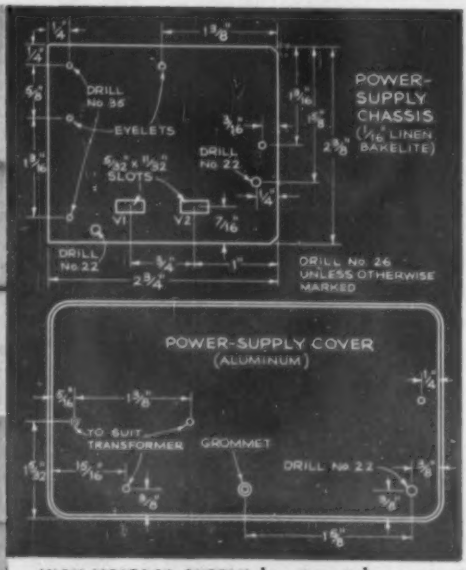
Now insert the B1 cells and switch to .3 setting. The meter should still read about .2 ma. If it goes higher (with no radioactivity near) there may be leakage at the Geiger sockets. Check by removing all Geiger tubes; on all three range settings you should get about the same .2 ma. reading as at "Test."

With tubes in, a slightly higher reading is normal on the two upper ranges, due to "background count" from cosmic rays and other sources. The AEC set of four bottles of uranium ore is valuable for checking. Although not calibrated, the radioactive button listed is handy for field testing. END

Midget vibrator, two tiny tubes supply high-voltage direct current







HIGH-VOLTAGE SUPPLY has two tubes, mounted in miniature sockets. Sponge rubber in case bears against glass-tube envelopes. One end of C2 goes to the "hot" vibrator contact (with red wire on it). Yellow lead and one end of B1 go to ground lug under transformer-core bolt.

KEEPING THE Home SHIPSHAPE

FLATTEN THE TOP of a refrigerator with a tray so you can park food and have a hand free to open the door. Place the four screw-in suction cups to fit curvature of the box.

AN OIL CAN makes a handy dispenser for spot-squirting weed killer into the roots of dandelions without getting any of the chemical on nearby grass.

PAINT PADDLES drilled with ¼" holes do a faster, better mixing job. Cut out a few whenever you have leftover scraps of tempered hardboard.

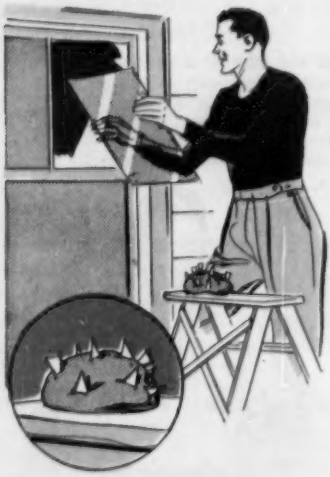
A LINING cut from a desk-size blotter will absorb moisture and reduce clatter when you stack away pots and pans in a metal drawer.

WHEN TIGHTENING FLOORS of hardwood, drill holes before driving in the nails. Boards will be less apt to split, especially when you are driving nails near the ends.

Please turn the page for more home tips

More Home Tips

A BLOB OF PUTTY stuck to ladder or window sill will hold glazier's points, making them easy to grasp, hard to spill.

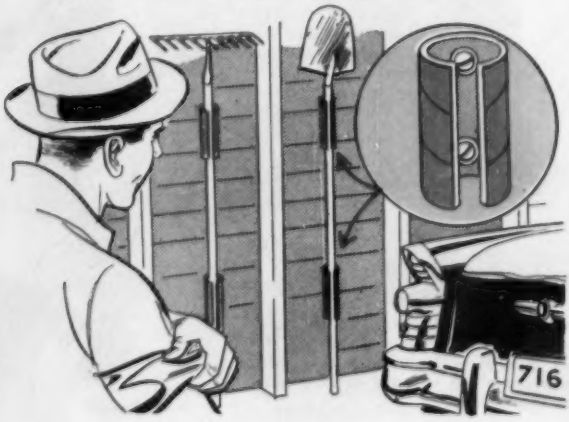


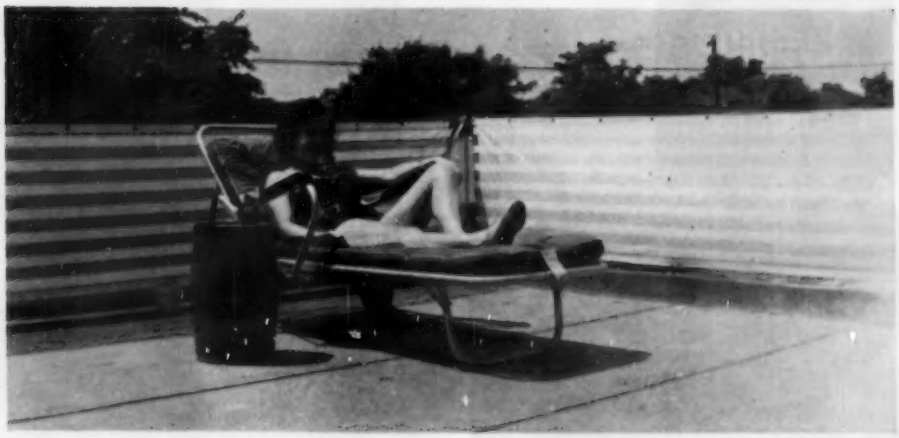
STRING A LINE between two picture hooks and a youngster can hang up a raft of drawings without marring the walls. Snap clothespins hang the art work on the line.

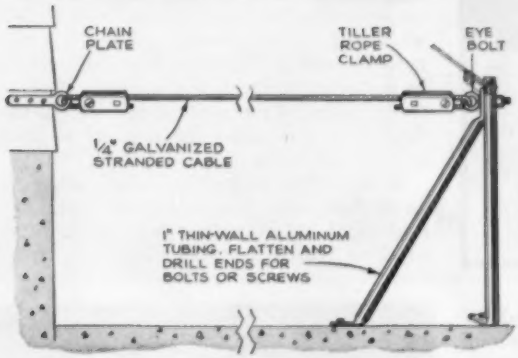
A FLAGPOLE ROPE will last through a good many more ups and downs if you wipe it well with a rag soaked with linseed oil before stringing it. If rope's already on the pole, draw it through oil poured into a pan.

PAINTING TRIM on a brick house? Keep a broken brick handy. When rubbed over spatters on masonry, the brick dust picks up paint. A chunk of concrete will do the same job on spattered concrete.

HANG UP THE SHOVEL AND THE HOE in grips cut from an old car radiator hose. Slit 3" pieces and fix them to garage or basement wall with screws and washers.





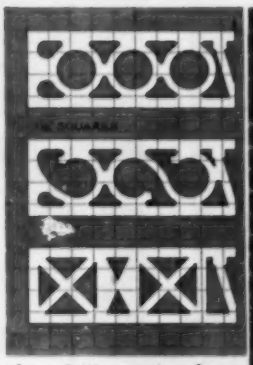


Railing Like Boat Deck's Encloses Your Sun Deck

LENGTHS of 32" weather-treated canvas lashed to a railing made of boat hardware will convert a flat roof or terrace into a sun deck with plenty of privacy.

Fittings you need are metal tubing for corner stanchions, steel cable, clamps, eyebolts and chain plates. Punch brass grommets into seams at the edges of the canvas and lace it in place.—*Elbert Robberson, Port Washington, N. Y.*

Jigsawed Wooden Grille Personalizes Screen-Door Decoration



EASILY cut from hardwood, a scroll or geometric grille adds interest to a screen door.

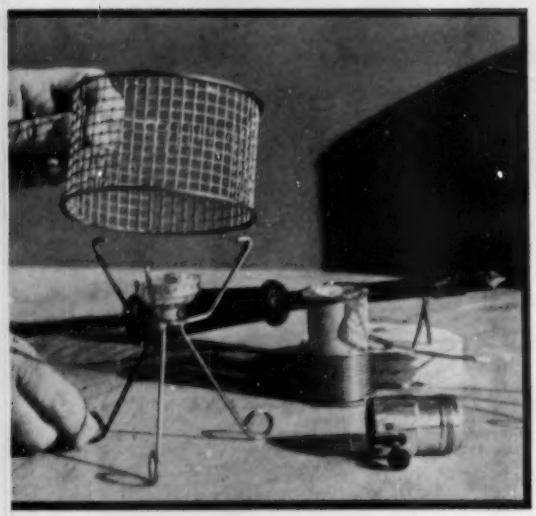
It will also protect your screen from children's pushes. Dowel or toenail the grille to the stiles at the height of the children's hands.

The patterns suggested were designed for a door with a 24" opening between the stiles. They can be adapted to any suitable length by changing the size of the squares on which they are laid out.

An initial incorporated in the design gives it a personal touch. I used a "V" for mine. —*John G. Voelker, Towson, Md.*

One-Evening Projects

Three Decorative Lamps for Your Home

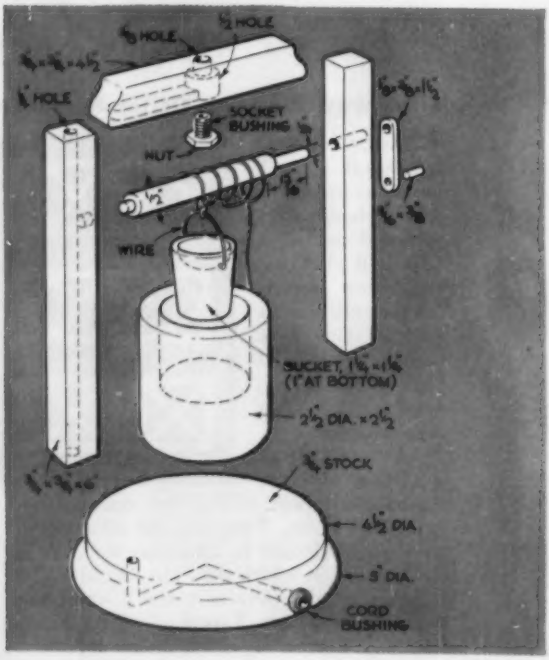


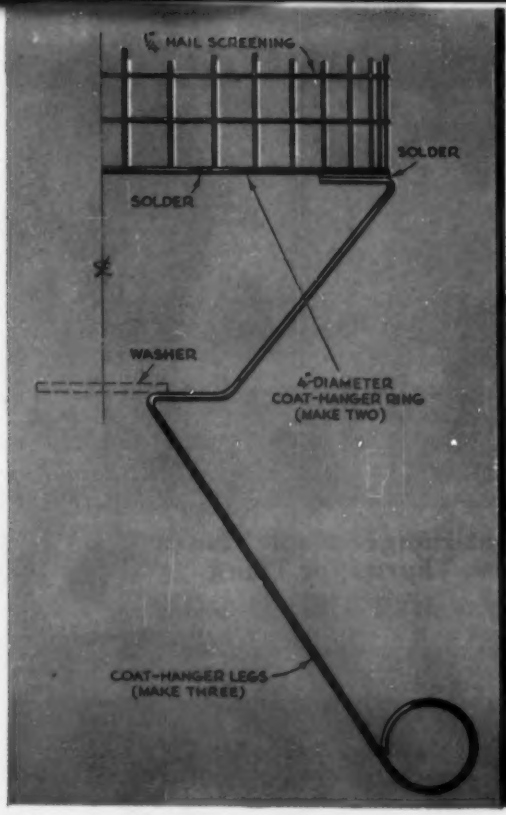
1 **Coat-hanger wire** and quarter-inch hail screening form the "wrought ironwork" for this attractive modern lamp. First, solder a lamp socket to a washer. Then remove the paint from several straightened coat hangers with sandpaper. Cut and bend the three legs and solder them securely to the washer.

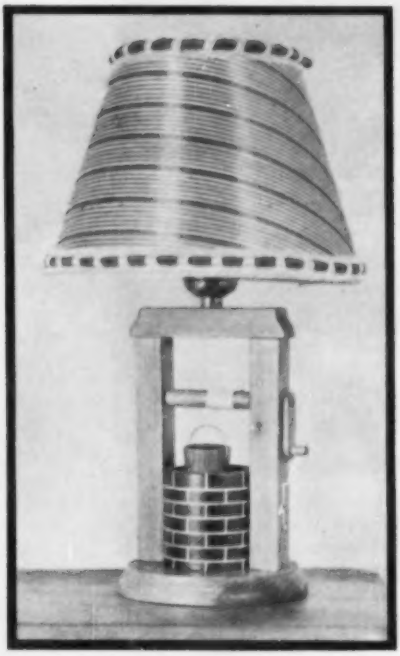
Make two 4"-diameter rings, filing slots where the ends of the wire meet, and floating in solder for strong joints. Cut a 2½"-wide strip of hail screening, bend it into a cylinder, and solder the ends of the cylinder to the inner surfaces of the rings. Position the resulting shade cage on the tops of the three legs and solder the legs to the ring at 120° intervals.

Scrub with detergent to remove soldering paste; then apply flat black paint. Set a 2½" cylindrical shade in the wire-mesh cage. *—Clifton Morris, Lubbock, Tex.*

2 **A porcelain vase** makes a restful TV viewing lamp. Drill one ⅜" hole through the bottom of the vase and another through one of its sides, using kerosene on the bit to ease it into the porcelain. Pass a ⅜" bolt through the hole in the base from below and thread it into the back of a light socket. Use the other hole as an outlet for a lamp cord with a feed-through switch cut into it at a point several inches from the vase.*—J. T. Whitaker, Mahanoy City, Pa.*







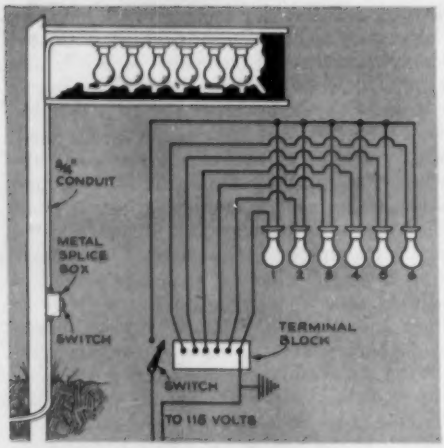
3 **A wood-turning lathe** with a faceplate will help you give this "old-oaken-bucket" lamp a whirl. Turn the base, well-body and bucket from maple or beech, and the windlass from ½" doweling. Make the windlass frame from ¾"-square strips of the same wood. Drill a hole in the center of the cross member for a light-socket bushing and nut; then carve a groove in its undersurface to carry the lamp cord to one of the uprights. Drill a ¼" hole through the upright and the section of the base beneath it. A quarter of the base circumference away, drill a ⅜" hole into the edge of the wood for another cord bushing. Connect the two holes with an L-shaped channel carved or routed in the underside of the base.

Before bradding and gluing the parts together, attach the lamp socket and thread the cord through the holes and channels. Also insert the windlass in the bearing holes before attaching the upright on the crank-handle side. Make the crank from a thin strip of wood and the handle from doweling. Drill holes in the bucket for a wire bail and tie a piece of cord a foot or more in length to the bail for a bucket rope.

Give all wood parts but the well-body a natural finish (two coats of shellac or varnish). Paint the well-body brick-red and apply gray mortar stripes with a brush or striping tool. Finally, wind the bucket rope around the windlass and, with bucket at height indicated, secure it with several drops of cement.—*Herbert Y. Moon, Orient, N. Y.*

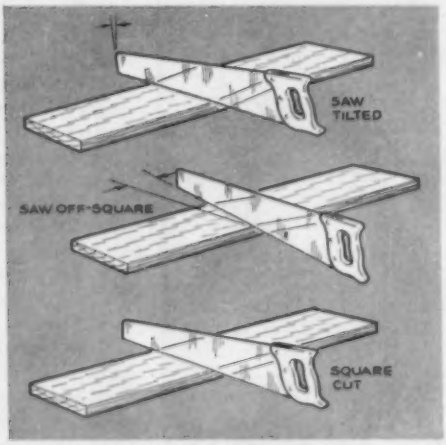
Coat-Hanger Hook Tames Rose Thorns for Tying

THIS coat-hanger hook lets you tie rose bushes up to a trellis without getting stuck by the thorns. Straighten out a wire hanger, leaving the original hook on the end, then bend in a second U-shaped hook 3″ or 4″ behind the first one as shown above. You can then reach in, pull up a stem and hook it temporarily to the trellis, freeing your hands to tie the stem in place.—*Louis Hochman, Sherman Oaks, Calif.*



Kink Reduces Bulb Changing

FOR easier light-bulb changing in my business sign, I rigged up a terminal block with separate circuits for six bulbs. Using one bulb at a time, I plugged the line lead into that terminal, and when that bulb burned out switched to the next circuit.—*Dick May, Riggins, Idaho.*



Bright Saw Cuts Square

YOU can saw true and square without a guideline if you keep your handsaw blade shiny. It's an old carpenter's trick to watch the board reflection in the bright blade. When the image is a continuation of the work, your cut is square.—*Robert Burgett, Hamilton, Ohio.*

Harness Holds Sprayer

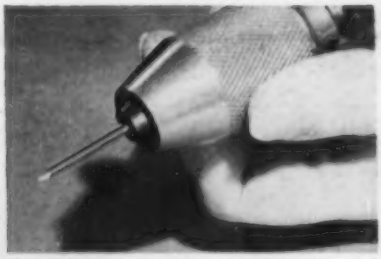
SPRAYING weed killer and other lawn chemicals is easy if you make a shoulder harness like this to carry the awkward one-gallon jug. Use web or leather straps and rivet them together. The spray nozzle, available at hardware stores, is made to fit such jugs.—*Harold C. Kimball, Salt Lake City, Utah.*

Drill Removes Dust

POWDERED concrete in a drilled hole forms paste if you dampen it, making easy removal possible. Re-insert the star drill, give it a few turns, and pull the paste out.

DO IT THE EASY WAY

A WORK-LIGHT SHADE is a ready-made funnel for pouring small items such as beans, seed and other dry materials into jars or bags. You'll have no spillage.



IN DRILLING PLASTER, a nail with the head cut off makes a good throwaway bit. For larger holes, hammer the point flat and sharpen with a file.

CUP HOOKS AND SCREW-TYPE BRACKETS can be used in perforated hardboard instead of the regular hangers, if you back the screws with wood blocks.

NEED A GROMMET? You can make a rubber one with a turn or two of friction tape around a dowel of the right size. Roll the tape up and off.

Aluminum Barrow Boosts the Payload

This contractor-type barrow is light and tough, easy to build, and it cuts dead weight in half.

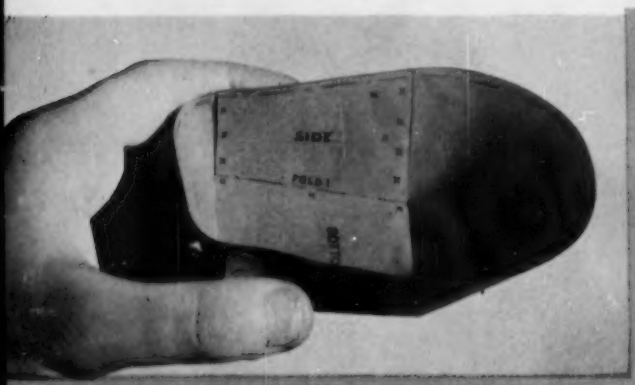
By M. G. O'Leary

SHOVING around a 70-lb. wheelbarrow is good for the back muscles. But if you want exercise, why not halve the weight of the barrow and put the extra pounds in the payload?

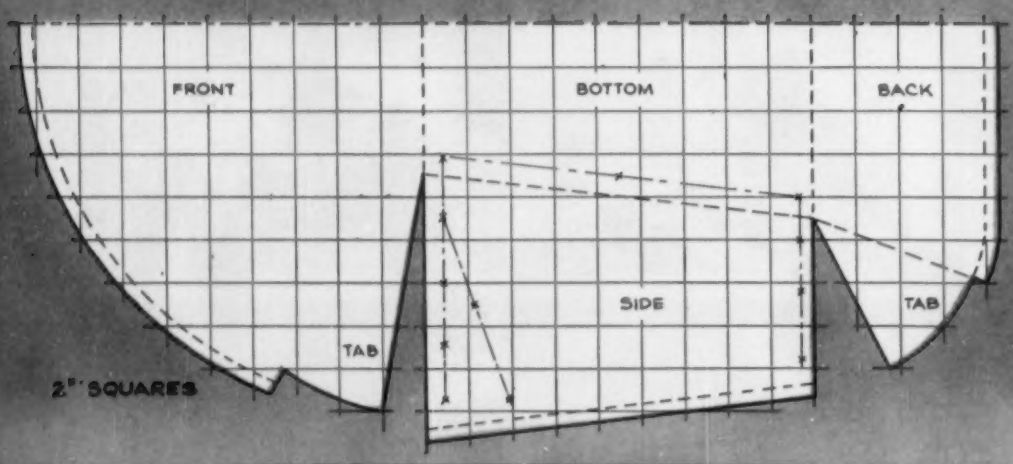
This husky aluminum wheelbarrow does just that. Made from standard stock for half the cost of a factory job, it weighs less than 30 lb.

Assembling the frame. The barrow frame dimensions suit a wheelbarrow with a 16″ pneumatic-tired wheel. If you use a smaller wheel, increase the thickness of the pine wedges that support the pan.

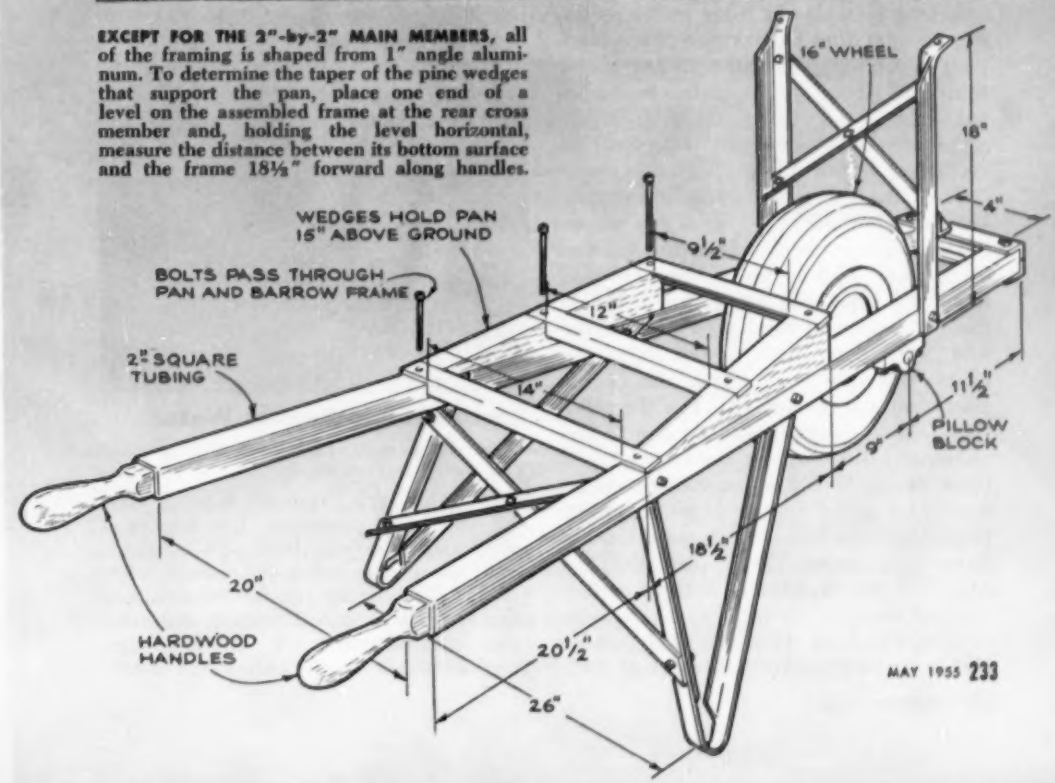
The main frame members are 2″-square aluminum tubing and the legs, cross members, vertical pan supports and diagonal bracing are all cut from 1″ angle aluminum. Pillow blocks align the wheel. All connections are made with ¼″

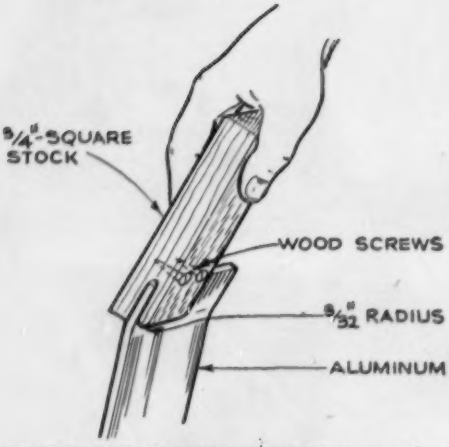


BEFORE SHAPING THE BARROW PAN, make a miniature pan from heavy wrapping paper, using the one-eighth scale drawing below as a template. With a little bending, the top edges of the model can be brought to a single, horizontal plane. Checking the angles of the folds in this miniature pan, you can shape the aluminum accurately, without over- or under-bending the springy stock.



EXCEPT FOR THE 2"-by-2" MAIN MEMBERS, all of the framing is shaped from 1" angle aluminum. To determine the taper of the pine wedges that support the pan, place one end of a level on the assembled frame at the rear cross member and, holding the level horizontal, measure the distance between its bottom surface and the frame 18½" forward along handles.





BEADING TOOL IS MADE OF HARDWOOD, reinforced with screws. The bending slot is 3/32" from one face of the block, and 5/8" deep. Round the thin lip to insure smooth bends.

bolts, washers and nuts. The wood handles are turned from 1⅞"-square stock.

Shaping the barrow pan. Scale up the barrow pan on a 40"-by-48" sheet of 16-gauge aluminum. Cut along the solid lines with large sheet-metal hand shears.

Before making any folds in the metal, form a miniature barrow pan from wrapping paper and study the angles of the folds and the curvature of the lip of the pan. This is important because once the aluminum has been bent it is hard to correct any errors.

To make the folds in the aluminum, lay the trimmed sheet on a box whose top is slightly smaller than the bottom of the pan. Letting the aluminum areas that will form the sides and ends of the pan overhang the box, set one of the fold lines flush with a box edge. In effect, this box edge forms one of the jaws of an improvised vise. For the other "jaw," lay a heavy board on top of the aluminum. Kneeling on the board, use a block of hardwood and a mallet to bend the metal down to the required angle. Repeat the operation to shape the other three pan walls. Then curve the top edges of the end walls with a mallet.

With the pan brought to shape, use C clamps to hold the joints in alignment and drill a single rivet hole through each lapped section near its top. Force a self-tapping screw into each hole.

Beading the lip of the barrow pan. From an 8" length of ¾"-square hardwood, make a beading tool like the one shown in the drawing. Starting at one of the joints, slip the beading tool over the edge of the pan and bend the aluminum outward slightly. Sliding the tool along, continue making bends at ½" intervals until you have gone completely around the edge. If the rounded corners at the rear of the pan give you trouble, heat the metal with a blowtorch, taking care not to burn it. The partially annealed aluminum can then be beaded easily. It will take three or four rounds of bending to bring the flange to a right-angle bend.

Now, shape a 9' length of galvanized-steel wire to fit into the partially beaded edge. Trim the ends of the wire to form a butt joint at the center of the pan front. Using heavy pliers, clinch the wire in place at strategic points. Crimp the rest of the flange with a series of close-spaced bites.

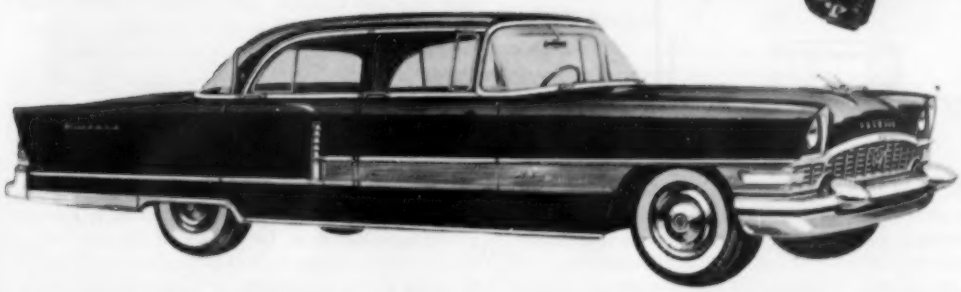
You can now drill the rest of the rivet holes. Insert aluminum rivets and form the heads with an ordinary hammer.

Finally, drill holes in the bottom of the pan for the six bolts that attach it to the wheelbarrow frame. END

Barrow Hauls Boat to Water

To MOVE a flat-bottomed boat a short distance to water, you can mount a wheelbarrow wheel in a fork made of scrap wood and nailed to a crosspiece. Use lengths of pipe for axle bearings. Held with a luggage strap, the barrow takes the weight when you lift the boat by regular transom handles. For a V or round bottom, shape the cross member to fit.—*M. C. Beveridge, Fairfield, Conn.*

CAR	*Packard*
DISTANCE	*25,000 Miles*
TIME	*238 Hours, 41 Min.*
SPEED	*104.73 M.P.H. Average*
SPARK PLUGS	*5-RIB Champions!*



NEVER BEFORE HAS ANY CAR GONE SO FAR SO FAST!

A Packard Sedan powered by a pre-production 1955 Packard Patrician engine and equipped with regular 5-Rib Champion Spark Plugs made automotive history in this 25,000-mile endurance test supervised by the AAA.

Its dependable Champions functioned perfectly as the car covered a distance greater than the earth's circumference at an average of 104.73 m.p.h.—one of the most remarkable performance runs ever made by a motorcar.

MORE PROOF that full-firing Champions and top performance are a natural combination in *any* car. *MORE REASON you* should make the change to Champions—soon!

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

AMERICA'S FAVORITE

5-RIB

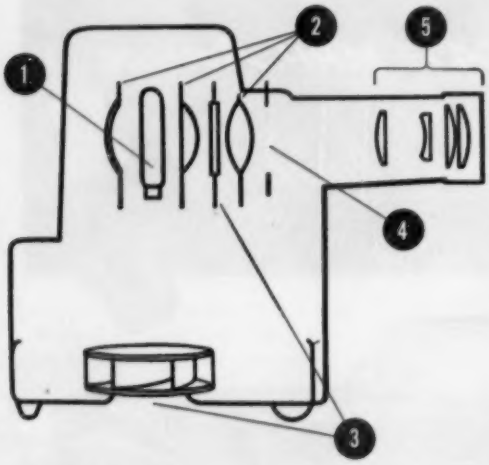
CHAMPION

SPARK PLUGS

NEXT TIME YOUR CAR IS LUBRICATED—HAVE THE SPARK PLUGS CHECKED. IT PAYS!

What makes a Good Slide Projector GOOD?

You can't judge a car by its coat of paint. Likewise, there's more to making a good color slide projector than meets the eye. It has to be a completely engineered system made up of several important sub-systems. If the engineering is good throughout, you have a good projector. As an example, let's use a Kodaslide Signet Projector, shown in the cross-sectional diagram below.



1. This is basic power. The higher the lamp wattage, the brighter the screen image. Choose enough wattage to meet your particular needs. 500 watts, with an efficient condenser lens system, provide extra-brilliant big pictures. 300 watts give intermediate brilliance. If you're looking for economy, 150 watts often provide adequate illumination.

2. This is efficiency. A projector's condenser-lens-and-reflector system collects and directs the light from the lamp to your slide. The more efficient this system, the brighter the screen illumination. While a single condenser lens may be used, a compactly designed two-lens condenser system, such as shown here, provides greater efficiency.

3. This is safety. Since all lamps radiate heat, special protection for slides is required with higher wattage lamps. For best protection this should consist of: (*a*) an extra-thick, high-efficiency heat-absorbing glass between lamp and slide, (*b*) an efficient blower cooling system (make sure the blower is quiet and provides a smooth flow of air) and, (*c*) baffles to direct air in channels over lamp, condenser lens system, and slide.

4. This is convenience. Slide-changing mechanism should provide smooth, rapid scene change for eye comfort; offer no chance for mix-ups. Kodaslide Projectors' unique vertical feed system provides smooth, almost instantaneous slide change; prevents jarring or movement of projector; eliminates unintentional repeat projection.

5. This is picture quality. A *good* projection lens will faithfully reproduce on the screen all the color and detail of your slides with edge-to-edge sharpness and clarity. Such fine definition and color correction are found in the 5-inch Kodak Projection Ektanon Lenses. You have a wide choice of projection distances and picture sizes to fit living room, classroom, or auditorium.

Lamp Wattage			Screen Width	Distance from Projector to Screen 35mm (24 x 36mm) slides
500	300	150	30 inches	10 feet
			4 feet	15½ feet
			5 feet	19 feet
			6 feet	23 feet
			7 feet	25½ feet
			9 feet	32½ feet

All of the above essentials have been given due weight in designing Kodaslide Projectors (see facing page). Your Kodak dealer will be glad to demonstrate them and give you specific advice.

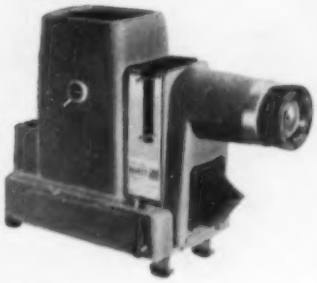
Here are the newest Kodak projectors

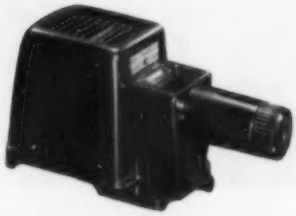
Kodaslide Signet 500 Projector

Lumenized optics, 500-watt lamp for amazingly bright pictures; Kodak Projection Ektanon Lens, 5-inch f/3.5; automatic take-up changer gives smooth, quick slide changing; slides stacked in order shown, in receiver or Kodaslide Box (see below); accepts Airequipt Changer; individually spring-loaded front legs for 0-12° elevation; adjustable rear leveling leg; quiet, powerful impeller-type blower. $72.50. With 5-inch f/2.8 lens, $79.50.

Kodaslide Signet 300 Projector

Budget-priced 300-watt version of Signet 500. Has same superb optics, unique slide-handling system, many other features of Signet 500. With f/3.5 lens only. $59.50.

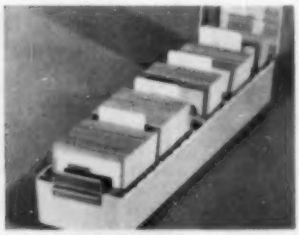




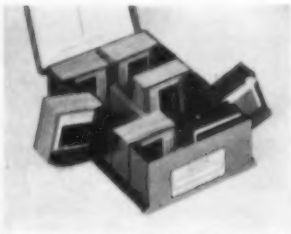
Kodaslide Merit Projector

150-watt lamp; fine 5-inch f/3.5 Lumenized lens; non-jar feeding; convection cooling; surprising brilliance and clarity at modest cost. Only $23.95.

KODASLIDE BOX—Holds 20 cardboard slides. Serves as slide receiver with the Signet projectors. Fits into Kodaslide Ready-File. 6 for $.75.



KODASLIDE READY-FILE—Just right for carrying. Holds 200 cardboard or 100 stereo slides. Accepts 6 Kodaslide Boxes. Includes index. $1.95.



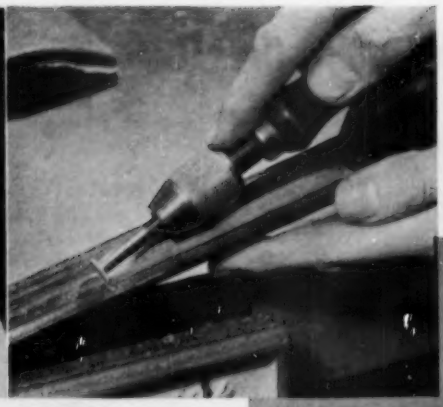
KODASLIDE COMPARTMENT FILE—Holds 240 cardboard or 96 glass slides. 12 swing-out compartments. Includes index. $3.94.

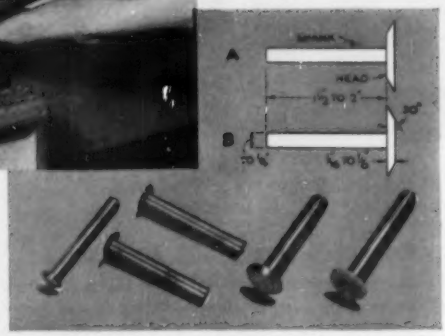
Prices are list, include Federal Tax where applicable, and are subject to change without notice

EASTMAN KODAK COMPANY
Rochester 4, N. Y.

Kodak
TRADE MARK

NEW Shop Ideas



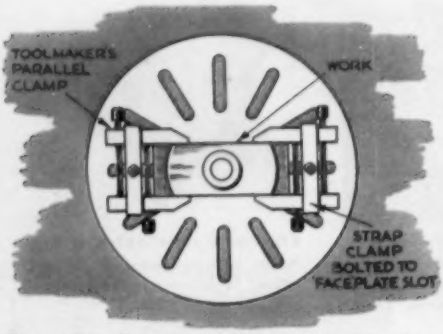


Round Scrapers Do Odd Jobs. With these circular scrapers you can remove paint from moldings, smooth or enlarge holes in soft materials, make half-round grooves in wood, carve wood or plastic, or even, by rolling the tool like a rotary knife, neatly trim cloth or paper.

To make one, chuck a piece of drill rod the diameter of the desired scraper head and turn a 2″ shank to fit the handle the scraper will be used in. Cut off about ⅛″ back of the shoulder so formed. Reverse in the lathe, face true, and with the compound rest form a 30° bevel on the inside or the outside of the scraper head. The shape shown at *A* in the drawing is best for pushing, while that at *B* is preferable where the tool is to be pulled or drawn.

Use a file and then a fine abrasive stone to sharpen the edge, as at the left above. Heat cherry-red and quench. Temper by heating until a polished area turns light yellow. Cool in air.

A pin vise or chuck handle, as in the photo, holds scrapers interchangeably.—*Walter E. Burton, Akron.*



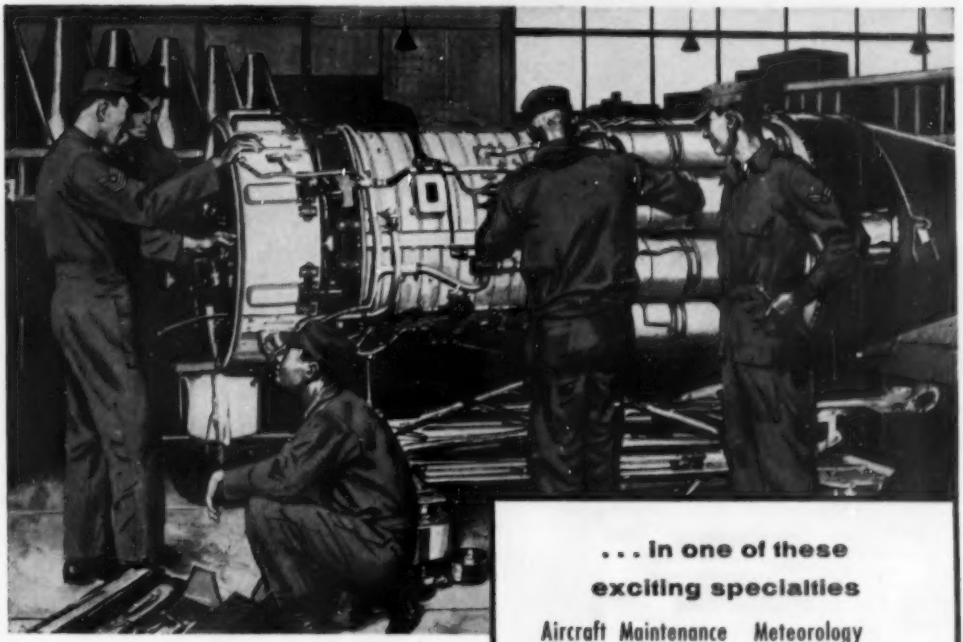
Mounting Faceplate Work. When work is to be faced right across, ordinary clamps or straps may run afoul of the tool. A convenient way to mount such pieces is with two parallel clamps. Screw these tightly on the ends of the stock, well back from the working face. Hold them on the faceplate with strap clamps placed across their jaws as shown in the drawing above.

Tool Cuts Parting Pips. A parting tool may leave a small pip on the cutoff. The simple tool above will quickly and cleanly remove such pips from one or many pieces.

Grind a shallow radius across the end of a high-speed lathe tool. Dub off the corners as shown. Lay the pip in the groove and tap the work with a hammer. Use a soft hammer if the finish is important.

 Please turn to page 240 for more shop tips

You can train with the U. S. Air Force



Are you interested in engines, electronics, radio, or other technical specialties? If so, you belong in the U. S. Air Force! As an Airman, you may have the opportunity to learn from the ground up, and become a specialist in anything from Turbo-jet mechanics to Radar or Electronics. You'll train with young men, men who will be quick to appreciate your skills and aptitudes.

You'll earn good pay and have unlimited opportunities for adventure and travel. What's more, you'll be assuring yourself of a good future . . . a future in which the training you may receive in the U. S. Air Force will pay you huge dividends for the rest of your life.

You'll go places—faster on the young man's team

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Communications	Radar
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Transportation

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Please send me more information on my opportunity as an Airman in the U. S. Air Force

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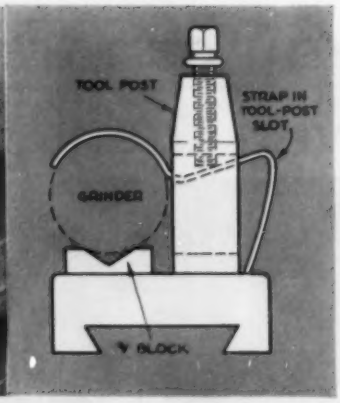
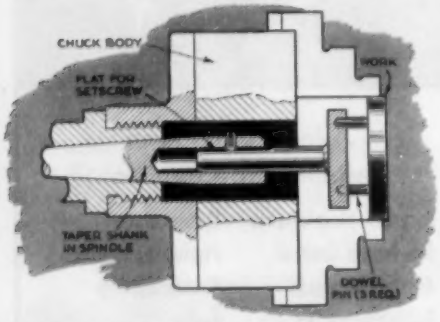


Quick Tool-Post Grinder. My problem was to cut some beryllium—a very brittle metal that would crumble under ordinary lathe tools. To do so, I rigged a small hand grinder on the carriage. The same setup will do any light grinding job.

Mounting was a simple matter. A piece of strip brass was shaped to the grinder housing and then formed to go through the tool-post slot and bear on the compound rest. A V block held the grinder at center height.—*John Henry Tavian, Redlands, Calif.*



Stop Trues Thin Work. Light stock cannot be faced fully across in the steps of the chuck jaws. Held in the straight jaws, it may not run true, or if it does, it may cock as soon as the cut begins.

This spindle stop holds the back of the work square, keeps it from shifting under heavy cuts, and can be used to locate repeat work accurately. It also permits drilling or boring to be done.

Weld or shrink a disk onto a short piece of drill rod. Drill holes 120° apart in the face and press in hardened dowel pins. Drill and bore a taper shank to a snug sliding fit for the shaft of the stop, and tap for a setscrew. Lock the stop in it; then grind the ends of the three dowel pins square in the lathe. Hold work firmly against the pins while tightening the jaws.—*H. J. Gerber, Stillwater, Okla.*

Nonstop Die Holder. With this tool-post die holder, you can run threads of any length on stock fed through the spindle—several feet long, if you remove the tailstock. Make it from steel, brass or aluminum to suit your dies. Drill and tap a hole in the top for a setscrew.

Mount the holder at 90° to the ways. Then push the tail center up into it, adjusting the cross feed to bring the die on center. Lubricate the work and run the carriage up to it by hand. Once threading, the die will probably feed itself, but give fine threads an assist with the handwheel. Reverse the spindle to back the die off.—*Phil McCafferty, Stanwood, Iowa.*

Add an extra room to your home —easily, economically

1. Do it yourself with Armstrong Temlok® Tile and Plank. Finish off unused space in the attic, basement, garage, or enclosed porch quickly with these attractive wood fiber building materials. Start by nailing up 1" x 3" wood furring strips at right angles to all framing members.

2. The Lok-Bevel* joint on both Tile and Plank has an extra wide nailing flange for quick installation. This special joint hides all nails or staples, assures neat joint lines, helps you do a really professional looking job. With Temlok Tile, you can choose a smooth or a noise-absorbing perforated surface.

3. Temlok goes up fast by either nailing or stapling. Use staples with ½" legs or 1¼" 3d box nails. Four nails or staples should be used for each 12" x 12" or 16" x 16" Temlok Tile. Finish the walls with Temlok Plank. Both Tile and Plank build, insulate, and decorate in one application.

4. No painting needed. Temlok is handsomely finished at the factory. There's practically no mess or waste—once Temlok is installed, the job is done. Add a few decorative touches and you've got that extra living space in the form of a game room, workshop, or bedroom . . . and at low cost.

See your lumber dealer now for price, size, and color details on Temlok Tile and Plank and information on other Armstrong building products.

Send for free booklet, "New Ways to Remodel Your Home." Write Armstrong Cork Company, 3705 Washington Avenue, Lancaster, Pennsylvania.

* Trade-Mark

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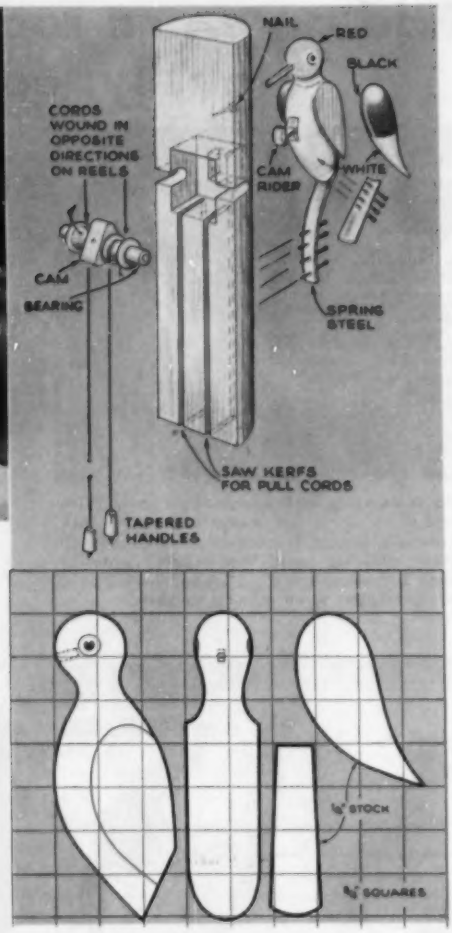
Cushiontone® • M-67® Monowall® • Hardboards • Insulating Wool • Counter-top Cement



Woodpecker Knocks When Callers Come

What tyke would use a doorbell with this saucy bird at hand?

WHEN guests pull one of the cords on this novel door knocker a cam revolves, alternately pushing the woodpecker back on a spring and letting him snap forward for a series of sharp raps. Meanwhile, a second cord winds up.

Use a half-section of any log as a mount. Remove the bark and carve a pocket in the flat side for the cam. Extend a smaller channel through the log for the cam rider attached to the bird's breast. Cut slots for camshaft bearings (brass tubing), and saw parallel channels for the pull cords.

Cut the triangular cam from hardwood and wedge it onto a drill-rod shaft. Turn two drums from dowels and mount them on either side of the cam. Attach pull cords to the drums and give one of them six turns. Slip the bearings over the shaft and mount the assembly in the log.

After carving the woodpecker body and wings, glue the wings in place, insert a cut nail for a bill, and attach a cam rider shaped from brass stock to the bird's breast.

A clock-spring tail holds the woodpecker on the log. Fasten the spring to the bird with nails driven through the tail block and on through holes punched in the spring.

Now, cement and tack a strip of birch bark to the log. Before the cement sets, cut a hole for the cam rider and a slot to take the lower end of the spring, which is slipped between the bark and the wood. Attach the spring at a height that lets the cam engage the rider.—*J. M. Finn, Pittstown, N.J.*

Her kitchen will always look NEW

She works here...

you can make it easier for her!

Her kitchen is really her workshop. She takes pride in it, too—*when it's easy to clean up* after food preparation or dishwashing.

You can easily give her modern work-surfaces that clean with a damp cloth. St. Regis Panelyte doesn't stain, scratch or grow shabby. Refreshing in color and design.

Ideal for bathroom walls, vanity tops, too. Simple hand tools and Panelyte Contact Adhesive are all you need to install St. Regis Panelyte yourself. And you make worthwhile savings. Ask your building materials or floor coverings dealer for the large 4' x 10' sheets in one-tenth-inch or one-sixteenth-inch thicknesses.

Ask also for the free "Do-It-Yourself" practical instruction booklet. *Or get the coupon off today.*

ST. REGIS
PANELYTE
THE MODERN SURFACE

She can have her choice of many accepted designs, each in several colors.

St. Regis Panelyte is manufactured by St. Regis Paper Company, one of America's largest paper manufacturers, with resources ranging from raw materials in its own forest preserves to modern mills and plants and its own nation-wide distribution.

Send for FREE "Do-It-Yourself" Booklet

PS-555

St. Regis Paper Company, Panelyte Division
230 Park Avenue, New York 17, N. Y.

Send FREE instruction booklet to:

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Street.....

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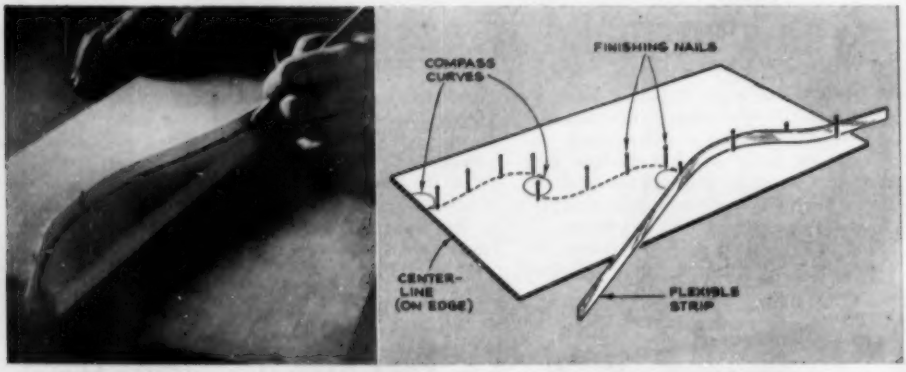
Glass Candy Case Provides Cold Frame for Early Garden

An old candy case from a salvage yard is a ready-made cold frame for plant growing. The plants get light from all sides, and you can easily reach them for cultivating by just sliding aside the doors in the rear.—*John Krill, North Lima, Ohio.*



Flexible Wood Strip Helps in Laying Out Pleasing Contours

If drawing freehand curves doesn't come easy, try laying out furniture-top or valance contours this way:

On cardboard half the length of the desired design, mark out with a compass any parts that are to have a true radius. With the cardboard on a wooden surface, drive finishing nails part way in at both ends and at points along the line where the curve is to change direction.

Now bend a strip of thin, straight-grained wood to shape over the projecting nails, flexing it here and there until it takes on a pleasing curve and touches the drawn compass curves. Then trace along the strip with a pencil.

If the curve is broken up, as in the drawing above, treat each part separately, using the strip to lay out a contour on each section in turn.

Cut out the profile so obtained and trace around it on the work to lay out half the design. Flip it over for the other half.—*J. M. Finn, Pittstown, N. J.*

Ah-h-h Spring!

Time to CHANGE OIL and OIL FILTER!

Buds are budding, leaves are leafing, spring is springing. Folks everywhere know the first robin is a sign that it's time to change oil and oil filter, too.

An AC Filter keeps oil free from harmful dirt, protects your car's engine from the damage dirt can do. In fact, an AC Filter takes out particles as small as 1/100,000 of an inch . . . *without removing the detergents from heavy-duty oils!*

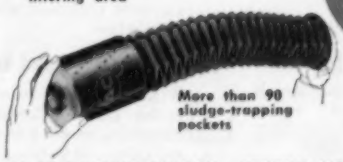
So, change to clean oil now, and *keep* it clean with a new AC Oil Filter. Change your AC Filter every 5,000 miles. That's the best way to keep "spring" in your engine all year long—and for years longer!

RESCUE your car with . . .

AC OIL FILTERS

Watch BIG TOWN NBC-TV

10 times the filtering area



More than 90 sludge-trapping pockets

GM GENERAL MOTORS

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

THE ONLY FACTORY-APPROVED FILTER FOR CADILLAC • BUICK • OLDSMOBILE • PONTIAC • CHEVROLET • GMC

CHOOSE THE DELTA TOOLS

CHECK THE DELTA TOOLS YOU NEED TO COMPLETE

1 DELTA 8" Tilting Arbor Saw

☐ Most widely used home workshop saw in the world. Famous Delta 10" Unisaw also available.

2 DELTA Deluxe 4" Jointer

☐ Puts a professional finish on stock up to 4" wide. New Delta 6" *Long Bed* Jointer also available.

3 DELTA 11" Drill Press

☐ Drills, mortises, routs, carves, shapes, and grinds with precision and speed. New Delta 14" Drill Press also available.

4 DELTA High Speed Shaper

☐ Cuts smoothly and rapidly at all possible angles to the grain. Interchangeable spindles for wide variety of cutters. Cabinet model also available.

5 DELTA 12" Wood Lathe

☐ Finest home workshop lathe built. Turns wood, plastic, and even light metals. 11" model also available.

6 DELTA 24" Scroll Saw

☐ For fast, accurate, intricate curve cutting. Speeds up to 1700 smooth cutting strokes per minute. 16" model also availbale.

7 DELTA 14" Band Saw

☐ Most rugged and accurate band saw of its size. Cuts up to 6" hardwood smoothly, curve or straight line. Delta 10" Band Saw also available.

8 DELTA 8½" Disk Sander

☐ Sands, drills, grinds, buffs —puts professional finish on straight, curved, or angular surfaces.

9 DELTA General Purpose Bench Grinder

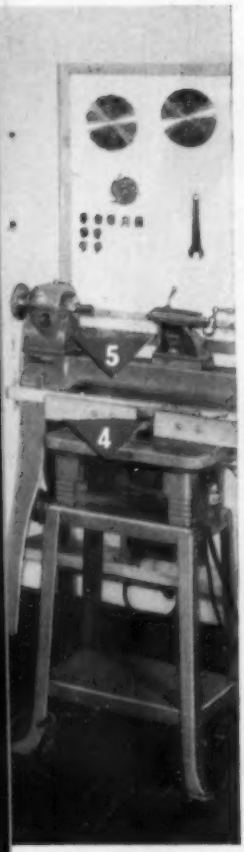
☐ Most rugged, powerful, fast, and smooth running home workshop grinder built today! Used in many industrial shops.

YOU'D LIKE TO WIN

IN DELTA USERS'

"Finest Home Workshop" Contest

There's still time to get into Delta's big contest to discover the *best* home workshop use of the *finest* tools made today. If you own three or more Rockwell-built Delta tools (the DeltaShop counts as *four*) you have as good a chance as anyone to win the first prize of $1000 worth of Delta Tools of your choice, or thirteen other valuable power tool prizes!



Delta Quality Makes The Difference

In the picture at the left are just a few of the many Delta Tools from which you can choose if you win. And if you're like most real home craftsmen, you know there just aren't any finer tools made. Delta is the power tool pioneer, with years of experience in building precision tools to meet the exacting standards of industry. In fact, many of the tools from which you can choose as a winner are the *same* quality tools used in wood and metal working plants throughout the United States.

Get Started NOW

The big Delta contest closes July 15th—there's still plenty of time to enter, and *win*. The Official Entry Form (which must accompany your entry) gives you the complete contest rules, the complete list of prizes, and tells exactly how to prepare your entry. Get yours from your Delta Dealer (he's listed under "TOOLS" or "MACHINERY" in your classified phone book), or send the coupon below.

DELTA QUALITY POWER TOOLS

Another Product by **ROCKWELL**

OUR SHOP

DELTA Accessories:

•Delta matches the world's most complete line of fine power tools with the most complete line of accessories to make each Delta Tool even more versatile, more useful. Accessories also available as prizes to winners.

DELTA ROCKWELL

Delta Power Tool Division, Rockwell Mfg. Cor
504-E N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send me an Official Entry Form for the Delta Users' "Finest Home Workshop" Contest.

☐ Please send latest Delta Homecraft Catalog (10¢ enclosed).

☐ Please send Delta "8" Catalog, showing Delta's larger units, such as 6" jointer, 24" scroll saw, 14" band saw, etc. (10¢ enclosed).

Name_____

Address_____

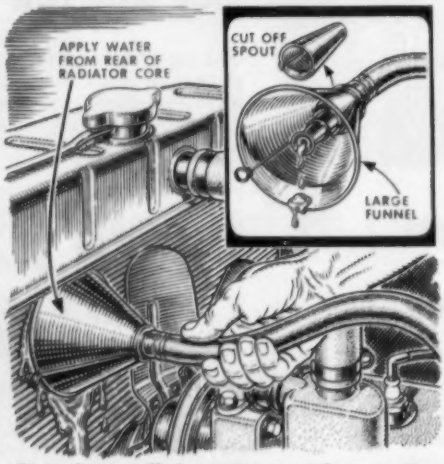
City_____ County_____ State_____

Hints FROM THE MODEL GARAGE

In making a gasket, you can locate and cut bolt holes in one step with a steel ball slightly larger than the hole. Cut the gasket to shape and place it on one surface to be joined. Tapping the ball lightly over the hole makes a clean cut.

A roadside reflector can be made from a discarded electric heater of the reflector type by covering the concave surface with luminous paint or strips of reflector tape. It makes a neater job if you first remove the wiring and old heater element.

Installing a guide rail on the opposite garage wall helps you leave room to get out on the driver's side. When the fender guide on your car just touches flexible fingers cut to length from an inner tube, there's room to open the other door, too. Insert fingers in saw slots in a one-by-three.



Cleaning radiator-core openings to free them of collected insects can be done without wetting the ignition. Cut off the spout of a funnel and adapt the top part to fit over the hose nozzle. Splashing water will be deflected back to the core and run harmlessly to the ground.

Please turn to page 250 for more auto hints

Here's what HERTZ RENT A CAR found out about Car-Plate –

Easiest way to put on the toughest kind of wax

HERTZ picked 20 of its rental cars in cities across the U. S. One side of each was waxed with liquid Car-Plate, the other with one of three well-known paste waxes.

HERTZ FOUND: *Car-Plate is far faster, easier to apply than any paste auto wax.*

After months on the road, the sides were compared for wear and shine.

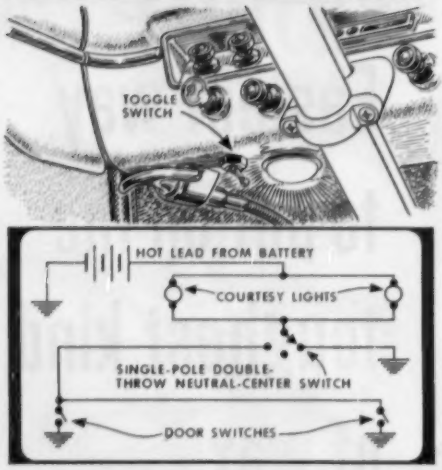
HERTZ FOUND: *Car-Plate lasts as long as the most durable paste auto wax.*

The reason: All the Car-Plate wax *stays on* your car—you don't rub wax *off* as when polishing paste wax. The Hertz test car shown here was driven 3 months, then simply washed and photographed. If you can't tell the Car-Plate side (right) from the paste side, why waste hours rubbing? Next time wax with Car-Plate!

Before waxing use Car-Plate Cleaner. Wax will bond perfectly in a brilliant, long-lasting finish.

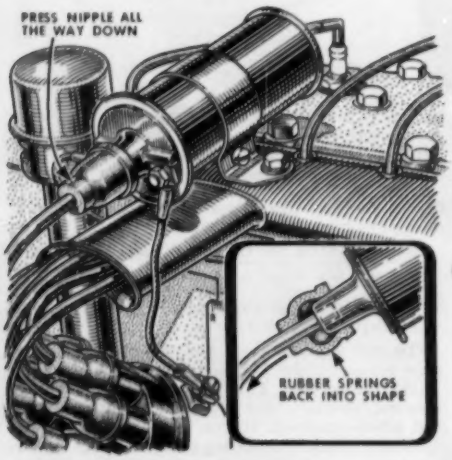
JOHNSON'S CAR-PLATE WAX

MORE Hints from the Model Garage



Courtesy lights or dome lights can be controlled with a three-way toggle switch in the circuit. On one side the switch gives you light while the doors are open; on the other the light remains on whether the doors are open or shut. The center position is at "off" at all times.

An office-in-the-car is easy to contrive with a tape recorder mounted on the front seat. To keep the recorder level, strap it to a plywood base having sides curved to the contour of the seat. It's a business-trip convenience to permit report dictation while held up in traffic.



When rubber boots are used on ignition-coil or distributor high-tension wires, you should push them all the way down on the tower. Otherwise the tendency of rubber to spring back into shape may force the wire out and break the connection.

An exhaust deflector clamped on the end of the tailpipe is not just for looks. It is a good way to keep exhaust gases from discoloring your bumper chrome. Bushings are available for clamping a deflector to a small-diameter or oval tailpipe.

WANT THE

COOLEST SMOKING MIXTURE

YOUR PIPE EVER HAD?

THE ANSWER IS IN THIS POUCH!!

WHY A MILLION MEN HAVE SWITCHED TO HOLIDAY

Only Holiday gives you this custom blend for Mildness

Yes, five famous tobaccos skillfully blended into a mixture of unequalled flavor, aroma and mildness. These fine tobaccos selected from all parts of the world, are blended with a base of cool-smoking white burley to make Holiday America's finest pipe mixture. Try a pipeful . . . enjoy its coolness, flavor and aroma . . . and see for yourself why more and more men who smoke mixtures are switching to Holiday as a steady smoke.

Only Holiday has this Wrap-Around Pack!

No other pocket tin or pack will pass the "Goldfish Bowl" test. Try it yourself—it's absolute proof that the Holiday pouch is sealed air-and-water tight, guaranteeing you a fresher, cooler-smoking tobacco.

HOLIDAY

SMELLS GOOD—SMOKES GOOD

AMERICA'S FINEST PIPE MIXTURE!

IF YOU PREFER A BLEND OF STRAIGHT BURLEY

Try Edgeworth—choice cool smoking white burley in the air-tight pouch. America's finest pipe tobacco.

SPECIAL OFFER $1.50

Get this new polished aluminum stem "Park Lane" pipe with interchangeable imported briar bowl and exclusive "*dri-dome*" which traps moisture to insure a dry, cool smoke—along with 2 full-sized pouches of Holiday Tobacco. If your dealer cannot supply you, use this handy order blank.

Name_____

Address_____

City_____ State_____

Mail with $1.50 to Park Lane, Larus & Brother Company, Inc., Richmond, Va. Offer good only in the U.S.A. PS-5

Gus Rescues a Competitor
[*Continued from page 170*]

less for me to install one of my batteries in the car. Doc might just be cunning enough *not* to leave a switch on at night—it wouldn't prove a thing. I've been over this car with a fine-tooth comb. There just isn't a short in it."

"It's got to be the battery then," Stan declared.

"I just can't believe that," Gus said. "Not when Williams has tried three different batteries."

GOING over the problem again, Gus could see no other alternatives: There was either a slow juice leak or Doc was deliberately killing the battery.

To get around this latter possibility, Gus arranged to have the car left at the Model Garage for several nights. Strangely enough, the battery held full charge now. This pointed a finger of suspicion squarely at Doc. Still, Gus couldn't believe it. Doc, he told himself, would be one to gallop a horse in the streets in protest, but he wouldn't stoop to take unfair advantage. With this thought firmly in mind, Gus went to work again on the big sedan.

He crawled under it like a badger, going over and checking everything he had done before. He polished and tightened terminal nuts, cleaned and tightened battery leads, spread and taped wires.

There seemed to be little to gain from road-testing the car, since it always went dead while parked at night. It had to be something, Gus thought, that Doc did to the car on one night, that he didn't do on another.

In desperation Gus disconnected the field lead wire from the voltage regulator and hooked an ammeter, which he knew he could trust for accuracy, between the hot terminal of the starter relay and the car's circuit. He'd drive the car now, Gus thought, and if the slightest short developed under road stress, he'd know it.

As Gus started out, the car interior was cold, so he snapped on the heater and defroster fans. Everything seemed to be working right, the generator doing its job, ammeter reading steady.

It was morning, and the sun soon began to work on the car's windows. Shortly the interior became too warm for comfort. His mind occupied, Gus leaned over and opened the cowl ventilator. Immediately the ammeter showed an extra six-ampere draw. That was queer, Gus thought. He closed the ventilator and the six-ampere draw went away. A gleam of satisfaction came to Gus's eyes.

"Maybe," he said aloud, "I've located something."

AT FIRST glance there seemed to be no way that the opening of the ventilator could produce juice drag on the circuit. The opened cowl ventilator shoved the defroster air hose against a hot lead on the firewall. But, Gus reasoned, what of it? That hose was made of rubber. It couldn't cause a short.

But minute inspection showed that there were stiffening wire windings in the air hose. A tiny spot of wear exposed a mere pinpoint of wire. This, when against the hot terminal, carried juice in the manner of a resistor, while limiting it to six volts. It wasn't enough to get the wire hot, but it *was* enough to kill a battery overnight.

If Doc left the ventilator open at night he got a dead battery. Closed, the battery stayed up.

"Just goes to show you," Gus told Doc, "how tough things can get in this business. A man might have missed that fouled-up ventilator forever. And you, Doc, at your age, should be ashamed of yourself, galloping around town like a mad hatter."

Doc puffed reflectively on his pipe.

"The old mare," he said, with a twinkle in his eye, "had more sense than this old fool. She didn't want to make that run. I'll go around and apologize to her—and to Roy Williams, too."

"That," Gus told him, smiling, "would be a darn good move, Doc." END

NEXT MONTH: Gus and the balky jeep.

Quiet...*as a tiger on the prowl!*

Complete Engine Silencing Makes the Difference!

Superior engineering and design have always made Mercurys quiet in comparison with other outboards . . . but the new Mark 25E sets new standards even for a Mercury! It's *super-silent!*

Complete engine soundproofing, not just intake and exhaust silencing, is yours with the Mark 25E, including a scientific sound absorber that blankets the entire powerhead, eliminating the need for power-restricting carburetor intake silencers. New Dyna-Float Suspension floats the engine on rubber, mounted in shear, to keep vibration away from your boat.

Here is the world's lightest, quietest, most compact electric starting outboard, with more performance than any 20 cubic inch outboard ever built! See your Mercury dealer — then "Go Quality — Buy Mercury!"

new KIEKHAEFER MERCURY mark 25E

18 h.p. Alternate Twin Hurricane Engine

Reverse Gear and Neutral

Ignition Key Electric Starting

Mark 25 model available without electric starting.

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Available in variety of striking new 2-tone color combinations.

Write for FREE illustrated catalog!

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[*Continued from page 107*]

seldom has time enough for all these side shows. The center ring, where final assembly takes place, is a one-story building a couple of blocks long. Surprisingly, it is not a straight-line deal with bits moving in one end and cars driving out the other. Instead, the final line writhes around like a snake with a stomach ache, wrapping itself about internal lines, splitting into branches and knotting into transfer points.

Let's imagine that, a few days ago, you ordered a red V-8 Hudson Hornet with air conditioning (live it up, boy!), and that I went for a green Rambler wagon with overdrive. Back in Scheduling, Al Pryse has performed his rites and the conveyors are loaded up to bring first your car and then mine to the final line. We walk to one end of the building and stop by an immense vista of tightly packed "Wash" bodies—shop talk for Wasp, Ambassador, Statesman, Hornet.

These bodies were hauled down from Milwaukee, six per truck, and shunted onto one of 16 body-storage conveyors, each 38 bodies long. They feed the Nash-Hudson part of the final line, acting as a reservoir or "float." There at the front of one line is a red Hornet body —your car.

Quickly the body is hoisted up and plunked down so that it moves sideways on a new conveyor. Traveling at a slow saunter, it passes between several hundred people who add wiring, tubing, steering, front suspension, shocks. You pause to watch a man put on a front coil spring (air-compress it, clamp it, fit on car, recompress it, pull off clamp). Then temporarily leaving your Hornet, you walk on to a strange line tucked within the main one.

Lazy Susan. Officially it's "front-end sheet-metal assembly." Actually it's an endless oval of moving fixtures, each on a traveling platform. Supplies of screws, rivets and chromed brand medallions are racked on each fixture. Workers step aboard the platform, do a couple of jobs and step off. Fenders, grilles, radiators and headlights funnel in to feed this huge lazy Susan. You see a red Hornet front end take shape, and behind it a green Rambler one. They go off in what seems to be the wrong direction, but they'll be back.

By now your Hornet's body, sporting its front suspension and wiring, reaches the end of its "make-up" line. Deftly switched hoists swing it high in the air where it neatly fills a gap in a file of semibuilt cars rolling by overhead. Each body hangs from a carrier with four J-shaped hooks. Following your Hornet is a green Rambler wagon—on the final line, Ramblers alternate with Nash-Hudson cars.

Motors meet. Farther along, a line marches in with engines and, to no one's surprise but yours, deposits a big V-8 with air-conditioning compressor on it just ahead of your car. Swiftly a team of eight or nine people take over. One man snares the engine with a hook; another thumbs the hoist controls to swing it up in the air, its transmission low; and others shoehorn it diagonally into its nest between the wheel housings. Immediately a masked welder appears on a moving cart and proceeds, alarmingly, to strike an arc by the front mount.

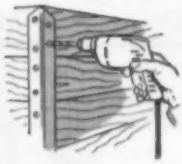
Distressed by the thought of an engine welded in place, you almost squawk in protest before you see that he is actually welding on a cross member that came bolted to the engine. In the future a mechanic can still pull and reinstall the engine; but on a line moving up to 50 feet a minute, with only seconds available, the V-8 slides in easier if the crosspiece comes later.

Meantime I've been goggling at the way they've popped an L-head six into my Rambler. Here the crosspiece was already in, so they dropped the hook through the front opening and snugged the engine up from beneath.

Things happen fast now. Another crew has trundled up a rear axle and torque tube under the Hornet on a high,

[*Continued on page 256*]

A WHOLE SKIL WORKSHOP for only $39.95!



Drilling jobs are simpler . . . in wood or metal.

Grind metal, sharpen knives or garden tools with proper accessories.

Sand and finish woodwork and furniture.

Polish furniture, shine the auto easier and faster.

Now! Own This Famous 32-Piece SKIL Drill Kit At Big Savings!

Try this kit and you'll fall in love with it! Amazingly versatile . . . and so superbly made that any craftsman will appreciate it. You'll use it for literally hundreds of jobs . . . *sanding, drilling, polishing, grinding, wire brushing.*

There's never been a tool value like it. A powerful ¼" SKIL Drill *plus* a whole battery of useful, high quality accessories. Compare this drill and attachments with any other. Tool for tool, there isn't a kit on the market that offers as much value. Made by the famous SKIL Corporation, for over 30 years leaders in the manufacture of quality electric tools.

Just look at all you get!

Model 549 SKIL Drill with geared chuck . . . Drill Stand . . . Rubber Disc Pad . . . Polishing Bonnet . . . 5 Sanding Discs . . . 2 Arbor Adapters . . . Paint Mixer . . . Grinding Wheel . . . Wire Brush . . . Countersink . . . 3 Wood Augers . . . 13 Drill Bits . . . Wall Type Carrying Case.

Model 515 Drill Kit—all this for only $39.95

Learn about the fun a SKIL Drill Kit offers. See it and try it at your hardware, department or appliance store.

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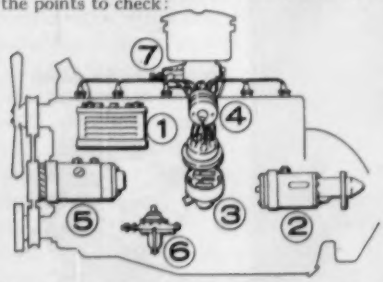
Factory Branches in ALL Leading Cities

Care and Feeding of Engines

BY S. P. CORP

TUNE-UP TIME

Lagging engine performance calls for a tune-up. Here are the points to check:



1. BATTERY—Test voltage of each cell. Cells should be equal. Tighten all connections, including those behind instrument panel.

COMPRESSION—Test compression of each cylinder. They should be within 10 lbs. of each other, and up to manufacturer's standard of 110 to 120 lbs. Low reading indicates leaking rings, valves, or head gasket.

VACUUM TEST—A vacuum gauge connected to intake manifold may indicate poor ignition, carburetion, or compression, which may be due to one of the following:

2. STARTER MOTOR—Test voltage and amperage draw while starter is cranking engine. See diagram.

3. DISTRIBUTOR—Remove and check in a distributor tester for operation of all speeds. Test manual and vacuum advance. Time the engine.

4. COIL—Use coil-tester to test output at all speeds.

5. GENERATOR—Test against manufacturing specifications.

6. FUEL PUMP—Test pressure, vacuum, and volume.

MUFFLER SYSTEM—Check for any exhaust restrictions.

CYLINDER HEAD—Tighten all cap screws and manifold nuts to specifications, while engine is hot.

7. CARBURETOR—Clean carburetor and air screen; check float level and jets against specifications.

VALVES—Adjust tappets while engine is hot, unless manufacturer says adjust while cold.

NEW FREE REFERENCE BOOKLET

A post card request will bring your free copy of "Care and Feeding of Engines," with many valuable do-it-yourself details on car care. Use Sealed Power KromeX Ring Sets for immediate oil control, finest performance, and longest wear in modern engines. Sealed Power, Dept. H-5, Muskegon, Michigan.

Sealed Power

PISTON RINGS

How They Produce Cars Nowadays

[*Continued from page 254*]

jack-elevated dolly. Watching the seven pairs of hands under the moving car, here about five feet off the floor, you note that most—not all—of this team are short people. "We *do* try to match a man's job to his size," a foreman answers you. "But there's a limit to the number of real short guys I get."

Slanting down until the cars are only a foot or two off the floor, the J-shaped carriers curve back to their date with the lazy Susan. Like a glove going onto an outstretched hand, a complete front end slides onto each car. High-cycle and air-driven tools secure it in seconds. After a plunge into a noisy tunnel for undercoating, the cars curve onto a long, straight line that looks at last the way you thing it should. On go mufflers, tailpipes and bumpers. The big J hooks delicately deposit each car on a moving chain and go sailing off overhead.

Smokers and cripples. Each car has a rendezvous with its wheels, which come sliding along, five of a color, on an overhead chute. (The chute divides in two, with an ingenious selector diverting three of a color to one side of the car and two to the other.) In go mats, seats and spare tires; from beneath each car a clatter of air tools tell of activity there, too. You watch a man connect the cables to a newly installed battery. "Naw," he tells you. "Don't get one 'smoker' in a hundred. If she does smoke, you pull off the cable and they check wiring later. Just means somebody's connected something wrong."

In go oil, water, gasoline. Then a coveralled man slips behind the wheel of your Hornet, flips the switch, runs the starter for a few seconds. The engine catches and he drives your car off the line. Another man steps up (be careful of my baby!) and drives the Rambler off under its own power. You wait while a dozen cars go by, obscurely hoping one won't fire up. But they all do, and you question a mechanic nearby.

"Sure, we get a cripple occasionally.

[*Continued on page 258*]

Thrill your child with this drop-leaf desk and bookcase!

get complete detail drawings, photograph and directions in

FREE PATTERN KIT 305

—along with picture-packed booklet, "Friendly Home Ideas in Western Pine." Write for it to Western Pine Association, Dept. 305-L, Yeon Building, Portland 4, Oregon.

the Western Pines

- IDAHO WHITE PINE
- PONDEROSA PINE
- SUGAR PINE

This desk — scaled to a child's proportions — is just like a grown-up's with pigeonholes, pencil racks, drawer, shelves and cabinet. And the mellow woods of the Western Pines* lend their own special charm to the simple New England design.

It costs so little to build this desk with the woods of the Western Pines. You'll find that they cut clean and accurately with hand or machine tools and take all finishes well.

Ask your local lumber dealer for the woods of the Western Pines — he'll be glad to give you an estimate!

TODAY'S WESTERN PINE TREE FARMING GUARANTEES LUMBER TOMORROW

UTICA® Adjustable Wrenches

FOR THE BEST IN GOOD TURNS

LOOK FOR THE NAME UTICA®

No. 91

Yes, many, many good turns because they offer you a very special UTICA feature. The jaws surfaces are extra hardened by UTICA's own process of electronic induction. Jaws resist nicks and burrs, stay smooth and new-like up to 10 times longer than ordinary adjustable wrenches.

An adjustable wrench is a mighty handy tool, but be sure to look for the name UTICA on the handle. Sizes from 4" up to 18"

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THE HALLMARK OF QUALITY

UTICA DROP FORGE & TOOL CORP.
UTICA 4, N. Y.

In Canada: Adlam Tool & Supply Co., Ltd., Montreal

Stop moisture damage

18¼" high
20½" long
11¾" wide

Just plug in the amazing FRIGIDAIRE electric DEHUMIDIFIER

Positively controls moisture in workshops, basements, or any closed area up to 10,000 cu. ft. where moisture is a problem.

See your Frigidaire Dealer for further details. Or write for free folder to Frigidaire, Dept. 2331, Dayton 1, Ohio. In Canada, Toronto 13, Ontario.

Built and backed by General Motors

My B&D Saw saved me all the back-breaking labor of hand sawing. And it cut really straight—I could see the blade follow the line.

Even cutting the hole for the sink was easy—and safe—thanks to the lift-lever on the blade guard.

Send for your copies of the Easi-Bild* Kitchen Cabinets pattern and Black & Decker's "Handy Tips" booklet. Use coupon below.

B&D 6 inch Heavy-Duty Saw—a professional tool at a popular price! Features a specially-designed, better-built B&D motor that cuts wood like butter; instant-release trigger-switch and telescoping blade guard with lift-lever for safety. Cuts 2 inches deep, adjustable from 0° to 45°. At hardware, lumber & department stores.

See "Tools-Electric" in phone directory for

Black & Decker®

PORTABLE ELECTRIC TOOLS

The Black & Decker Mfg. Co., Dept. 2053, Towson 4, Md.

Gentlemen: Please send me
☐ Kitchen Cabinets Pattern #201 (price: $1.00)
☐ "Handy Tips" booklet (price: 25¢)

Name .....

Address .....

City ..... Zone ..... State .....

*T. M. REG. EASI-BILD PATTERN CO.

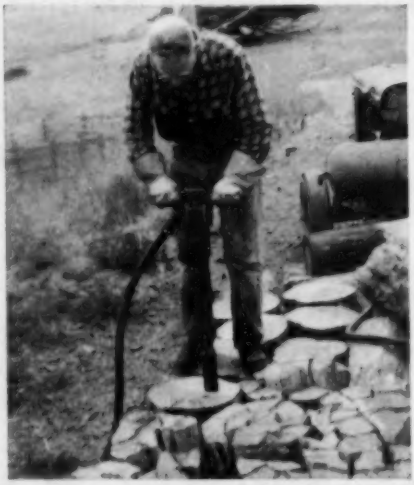
How They Produce Cars Nowadays

[Continued from page 256]

That's why I'm here. Usually just means a wire's off or the fuel isn't getting through."

Ahead, three freshly started cars are on test rolls—floor rollers that let an inspector drive an unmoving car while he rates brakes, transmission shifts and speedometer calibration. Then the newborn cars pass in slow double files over two long pits for an ordeal called Final Tune-Up and Inspection. Quick, clever machines align front wheels and headlights. Scores of specialists soberly scrutinize each car, rating it on a check list. Cars with a clean bill of health roll off to Shipping; those that flunk go to a Limbo called Final Repair.

There painters, mechanics and sheet-metal men do whatever has to be done before the cars are resubmitted to inspection. Your Hornet and my Rambler, however, sailed right through like most cars. Now they are waiting for *us* to baby them. END



Compressed Air Splits Logs

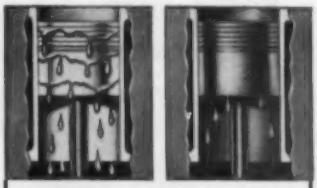
A RETIRED admiral, L. J. Hudson of Carmel, Calif., here demonstrates his ingenious method for feeding the fireplace. He bought a used air compressor, attached it to a Thor pavement breaker and made his own splitting wedge. He says the angle of the wedge is the key to its success.

HOW AUTO ENGINEERS KEEP THEIR CARS TUNED UP WITH MIRACLE POWER

When engineers take a technical product to their hearts, you can bet it's really good. And auto engineers themselves tune up their engines with Miracle Power.

They know that most motor wear takes place in the first five minutes after you start your car, before oil has been pumped to all moving parts. They know, too, that the temperature in combustion chambers goes as high as 1400° F, while oil burns off at 550° F. And oil that's burned off can't lubricate. That's why even new cars can develop sticky valves, noisy hydraulic valve lifters, and sluggishness.

But Miracle Power provides lubrication under *all* circumstances. It contains colloidal synthetic graphite in suspension. The graphite forms a lubricating film that sinks into metal like hot butter into bread. This coating won't burn off and it doesn't build up. It keeps your engine always tuned, prevents dry starting damage, lubricates in the combustion chamber, frees sticky valves and hydraulic lifters, cuts oil consumption.



It takes up to 5 minutes for oil to be pumped to all moving parts of your engine. Meanwhile, your motor is running "dry" . . . and wearing out fast. Miracle Power prevents dry starting damage.

Car makers recommend Miracle Power®

Miracle Power is not a chemical. It's *all* lubricant, and the **only** product of its kind approved by and specially packaged for leading car makers and their dealers—Ford (shown here), Kaiser, Willys. It *has* to be good.

Follow the lead of auto engineers and prove it yourself. Add an 85c can to your oil and gas every 1000 miles; use the 39c size in gas between treatments.

Get Miracle Power at car dealers, garages, service stations. It treats the engine, not the oil.

Miracle Power Division
THE AP PARTS CORPORATION
C-5 AP Building Toledo 1, Ohio
Mufflers • Pipes • Miracle Power • dgf 123

YOUR
TOUGHEST
JOBS ARE EASY
WITH P&C
HEAVY-DUTY PIPE WRENCHES

You make end pulls, longitudinal pulls, and bends faster and easier with this rugged P & C wrench. Sturdy housing won't break; full-floating, quick-grip, non-slip, non-lock hook jaw, handy pipe scale; replaceable heel jaw. Adjustable nut spins easily. Comfortable, lightweight "I Beam" handle. Finish resists rust and corrosion. Sizes: 6" to 24". Guaranteed . . . the best tools money can buy.

Buy your P & C tools from this handy display.
Send 10c for catalog of 500 top quality tools.

P&C
HAND FORGED TOOL COMPANY

Dept. F3, Box 5926, Portland 22, Oregon

NEW 12-FT. POCKET TAPE MAKES L-O-N-G MEASUREMENTS EASY

made only by **EVANS**

Only $1.89

No longer need you make two measurements for 12-ft. jobs as you must do with shorter tapes. Chrome-plated case is no larger. Each EVANS Tape packed in FREE transparent Tenite utility case.

Marked So You Don't Have To Figure

No Other Tape Is Marked This EVANS Way

Work in feet and inches? Read here ▶
Work in inches? Read here ▶

King-Size 10-Ft. White-Tape

STANDS UP STRAIGHT

For Upright Measurements!

Wider (3/4") heavy-duty blade makes those long upright measurements easy and accurate. Exclusive EVANS double markings, same as 12-ft. pocket tape. FREE belt clip and Tenite utility case with every EVANS King-Size.

Only $2.39

At hardware stores everywhere in U.S.A.

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Evans & CO., Elizabeth, N. J.
Makers Of Evans "Long Tapes"—25-50-75-100 Ft.

"We'll be cooler this Summer, warmer next Winter, with

TWINSULATION"

"Dad said we could have our own bedroom in the attic *if we'd insulate it* ourselves with Gold Bond Twinsulation Blankets. They were as easy to put up as it looks in the picture... and fun, too!" say Lucy and Peggy S____, Eggertsville, N. Y.

INSULATE YOUR HOME now with new Gold Bond Twinsulation, the most efficient home insulation against summer heat and winter cold ever designed. Twinsulation has a *double* action. The fireproof rock wool center *blocks* heat, and the aluminum surfaces *reflect* heat. Twinsulation will actually keep your rooms up to 15° cooler this summer, and cut next winter's heat bill up to 20%. Soon pays for itself! So easy to install... you can do an average attic in a few hours time! Start now...see your Gold Bond dealer today!

NATIONAL GYPSUM COMPANY • BUFFALO 2, N. Y.

Send for complete How-To-Do-It booklet on insulating your home... then see your Gold Bond dealer!

NATIONAL GYPSUM COMPANY
Dept. PS-55, Buffalo 2, N. Y. S5

I enclose 10¢ for "Home Insulation" booklet.

Name.....

Address.....

City.....*County*.....*State*.....

Let's Go Driving on the Railroad
[*Continued from page 156*]

down. That raises or lowers the flanged wheels.

Other changes were made. The standard sedan low-pressure tires were replaced with heftier, light truck tires inflated to 60 pounds.

To keep the car on the rails, "air lifts" —often used by hot-rodders to stiffen their suspensions—were put inside the front coil springs. Because the rear wheels are not independently sprung, no such precaution was needed there. But three leaves were added to stiffen the semi-elliptics. Coils, just clearing the body with a light load, were put on to prevent bounce under extra weight.

> ***A cemetery is a place where a lot of over-ambitious drivers come to a dead stop.***
> —THE SIDEWALK SUPERINTENDENT

To get traction in the rear, 60 percent of the weight was put on the tires. In front, the flanged wheels bear 60 percent of the weight to keep them on the rails.

Wheel treads were altered to conform with the 56.5-inch width between rails by sawing the rims off the wheels and rewelding them. The frame was extended slightly fore and aft to take the anchorages for the flanged wheels.

No change was made in the rear axle, transmission or brakes. The rubber-tired rear wheels drive "100" on the road and on the rails. Standard hydraulic brakes stop it. Good judgment is required to drive it on the rails if they are slicked by rain, snow or ice. Traction under such conditions is even less than it is on a highway.

The car was rebuilt at the Central's Collinwood experimental shops in Cleveland on President Perlman's orders. He knew what he wanted—he had had a similar inspection car, with flanged wheels that had to be raised and lowered by hand, when he was head man on the Denver & Rio Grande Western Railroad. END

Under the Beauty...

Steel for strength...
Leather for comfort!

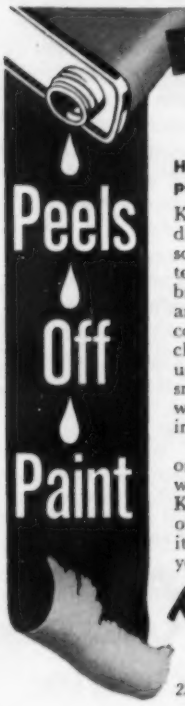
You'll like the skillful way that Estwing craftsmen combine leather and steel in making the world's only one piece hammers and hatchets.

Perfectly balanced and beautifully finished, Estwing is the choice of skilled tradesmen the world over.

Available at your favorite hardware store. $3.95

FREE Catalog on request

Estwing Mfg. Co., Dept. 4S, Rockford, Illinois



Fast, Safe
No Wash
Non-inflammable

How you can get perfect paint jobs every time!

Klean-Strip is totally unlike ordinary paint removers that dissolve the finish and are so messy to use. Klean-Strip actually breaks the bond between finish and surface . . . removes many coats with one application. It's clean, fast-acting and easy to use . . . leaves the surface smooth and dry, ready to paint without neutralizing or afterwash.

Use Klean-Strip on furniture, woodwork, walls, metal. Klean-Strip peels off any finish. Buy it when and where you buy paint.

KLEAN-STRIP

Paint Remover

THE KLEAN-STRIP CO., INC.
2340 S. Lauderdale, Memphis 6, Tenn.

FREE

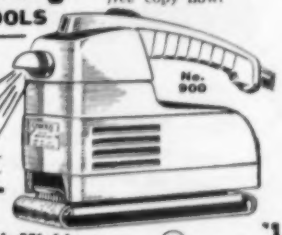
SANDING HANDBOOK

For DO-IT-YOURSELFERS!

Free new 20-page handbook explains sanding technique on wood, metal, glass, plastic; shows correct methods, names the proper tools for removing surfaces of different types of woodwork. Lists sandpaper grades, uses; tells how to sand hard-to-reach places, etc. Helps you save time, money on home projects—invaluable to beginners, experts. Authoritative, informative! Fully illustrated. Includes Syncro catalog of Sanders, Jig Saws! Send coupon for your *free* copy now.

SYNCRO TOOLS

NEW HEAVY-DUTY SYNCRO SANDER
Removes paint, varnish — outsands all others per dollar cost. Has sight-saving lamp — world's most powerful reciprocating sander motor (patented). Priced LOW.



SYNCRO CORP.
Dept. 2-SS, Oxford, Michigan UL Approved

Send me FREE Sanding Handbook, Syncro Sander Catalog, LOW Prices.

Name.....
St. & No. .....
City.....State.....

He's Building a Steam Car

[Continued from page 198]

Pursuing his fascination with the very small, Boss has built minute steam engines of ⅛" bore and stroke, with boilers to match. An experimental flash-steam car about 3" long has as its boiler a coil of small copper tubing, fed with water by a pump geared to its tiny double-acting engine. A more ambitious steam venture is the O-gauge locomotive shown on page 197.

In the same scale, Boss has added intricate detail to rolling stock, including vestibule steps that fold down and a dining car outfitted with tables and chairs; glasses, shakers and menus on the tables; and pots and pans in the galley.

But O gauge is too large to challenge Boss now. Not long ago he discovered TT gauge. Into a portable box the size of a suitcase he built a compact little layout complete with two-level track, figures, houses and landscaping (PSM, Sept. '54, p. 182).

Using kits as a basis, Boss added working valve gear to the locomotive, steps and ladders to the cars, and even ratchet wheels to the brake staffs. Until you use a magnifying glass, you have to take his word for it that these have teeth.

Boss makes human figures and such minute accessories as crossing signs out of steel and brass. Even the gutters and downspouts on the tiny general store in the layout are made of metal.

They were formed, Boss explained, by cutting strips of shim brass and drawing it through successively smaller holes in a die plate. I asked him why he hadn't used wire for the downspouts at least, since it would look exactly the same.

"Well," he answered with a perfectly straight face, "you couldn't drain anything through it." END

In the Heart of Texas

"What do you have that is of unusual interest in your city?" asked a dear old lady touring Texas.

"Well," said a native, "we have the only helium plant in the world."

"You don't say. Is it in bloom?"—*Wireco Life.*

Get the brake linings with the

IRON GRIP

Genuine Ford brake linings are heat-tested, torture-tested to prove they'll keep their iron grip

When new brake linings are called for in your Ford it's very much to your advantage to specify Genuine Ford brake linings. Here's why . . .

By insisting on Genuine Ford linings you are assured of (1) parts that are made specially for your Ford and (2) parts that have had to undergo 3,250 actual tests to prove they can "take it" under the most gruelling conditions.

When replacements will add to your Ford's performance, always make sure you're getting Genuine Ford Parts. *They're made right to fit right to last longer!*

Keep your Ford all Ford

May is National Safety Month—Be sure you can see, steer, stop safely.

GUILTY OF NEGLECT!

This motorist neglected to have his service man check his oil filter every time he changed his oil. The penalty: costly engine repairs. A clogged oil filter lets gritty road dust, hard carbon and sludge grind away at delicate engine parts. Keep out of trouble! Ask your service man to check your filter when changing oil. Insist on Purolator -- toughest, most efficient filter made. There's one engineered for every make of car. Refills cost as little as $1.60.

PurOlator

America's No.1 OIL FILTER

"Purolator," Reg. U. S. Pat. Off.
Purolator Products, Inc., Rahway, N. J.; Toronto, Canada

Diamonds Are Where You Make Them

[*Continued from page 112*]

and pressed it against a polishing wheel, he found a core of superhard matter that refused to wear away.

A tiny glittering crystal appeared in the midst of some dark, gritty stuff. Strong removed the crystal and tried one of its hard points against three of the hardest substances known—sapphire, which rates 9 on a hardness scale on which diamond is 10, and silicon carbide and boron carbide, which rate 9.5. The crystal easily scratched all three. Almost certainly it was a diamond.

Additional tests on this and other GE-made crystals proved that the scientists had, indeed, reached their goal. Tiny though they were, the man-made crystals scratched natural diamonds. They refracted light as natural diamonds do. They had the same chemical content as natural diamonds. And their "fingerprint"—the crystal structure shown by the X-ray diffraction pattern—was identical with that of natural diamonds that were compared with them.

When GE announced its findings, in February, it had produced diamonds more than 100 times, using a number of combinations of heat, pressure, time, and starting materials. It had also produced them in a 400-ton press as well as in the more expensive big one.

GE's largest diamond—not quite 1/16 inch long—is still the first one. All the others would be classified as diamond dust. Arranged end to end, 100 of them would cover a line no longer than one inch. But even such tiny stones have value. Industrial diamonds—essential for cutting, grinding, drilling, and polishing hard materials—cost about $7,000 a pound, and the U.S. uses an estimated $25,000,000 worth a year.

The company is not yet ready to produce even diamond dust commercially. Whether or not it can ever produce diamonds of gem quality and size, it does not know. "But if we can do it in a small way," says the company's president, Ralph J. Cordiner, "I think we can do it

[*Continued on page 266*]

VISIT YOUR PORTER-CABLE DEALER OR MAIL COUPON TODAY

PORTER-CABLE MACHINE CO.
5155 N. Salina St., Syracuse 8, N. Y.

Send complete information on the Model 115 Saw.

Name.....

Address.....

City.....Zone.....State.....

Now! Professional quality in a 7" saw — at only $75!

Stop envying the man with a Porter-Cable *quality* saw—see the great new 7" Model 115 *at only $75!*

Here's true *professional* design and construction—power and speed to spare—*ruggedness* for the hardest kind of use. Yet the 115 is light and compact, perfectly balanced—a honey to handle on any job.

Efficient 7" blade makes full 45° cuts in 2" dressed lumber. Big 10 Amp. universal motor and precision ball bearings give a speed of *4500 RPM under load*. Instant depth and angle adjustments, telescope safety guard, exclusive Kickproof Clutch. Accessory table quickly converts the Model 115 to a big-capacity, precision table saw.

Like all Porter-Cable tools, the 115 is *built to last* through years of faithful, dependable service. Look at it and try it soon.

MODEL 115 SAW . . . COMPLETE, ONLY $75

With Kickproof Clutch, combination blade, double end wrench, 10 ft. cord and plug. Full line of accessory equipment includes cross-cut and rip blades and guides, abrasive blades for problem materials, handy carrying case.

Porter-Cable
Homemaster Tools

IN INDUSTRY...

The grip, accuracy and durability of the Jacobs Plain Bearing Chuck have made it standard equipment all over the world. This model, especially designed for drill presses, features a Jacobs-engineered PLUS – the threaded locking collar for extra safety and more versatile use of the tool.

AND IN THE HOME SHOP

The Jacobs Plain Bearing Chuck equipped with threaded locking collar makes any drill press a safer, surer, more versatile tool.

Safer because the threaded collar keeps chuck locked on tapered spindle regardless of speeds or type of thrust.

Surer because it's a Jacobs, the most accurate, holdingest, longest lasting chuck of its kind – anywhere.

More versatile because it eliminates the necessity of using special collet chucks or similar adapters for holding routing, carving or dovetailing bits.

When you work with a drill press or portable electric tool you'll hold your drill or bit best when you use a Jacobs Chuck. There is none better for accuracy, grip and durability. The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

Jacobs RUBBER-FLEX COLLETS

Jacobs CHUCKS

IT'S A JACOBS—IT'S HOLDS

Diamonds Are Where You Make Them

[*Continued from page 264*]

in increasing quantities and increasing size."

Two rugged individualists in a New York City suburb let it be known, the day after GE's spectacular announcement, that they, too, had been making diamonds. But their diamonds were only dust, they said, so they had withheld the news.

One of these scientists was Dr. Leandro Tomarkin, a graying-haired, Swiss-born biophysicist who had come to this country as Secretary General of the Second International Conference of Physics, Chemistry and Biology, held at Columbia University in 1940. The other was Mario Vilella, a graduate of the University of San Juan, Puerto Rico, who had come to New York in 1945 as chief chemist for a research company.

A stocky, black-haired, intense young man, Vilella had devised an apparatus in his spare time into which enough heat could be poured and enough pressure applied—he thought—to make diamonds. Tomarkin, who had been interested in Moissan's experiment, thought Vilella's approach was promising. Further, he realized that if the young chemist's apparatus would turn carbon into diamonds, he should also be able to make interesting and profitable new alloys.

Tomarkin organized the Vitron Research Corporation, and raised $150,000 among his acquaintances—including a New York diamond dealer. Then he and Vilella moved their families to a secluded 17-acre estate in southern Rockland County, N. Y., and turned the cow barn into a laboratory.

They bought a press—only a 300-ton one, but big enough to give a 500,000-psi squeeze. They couldn't get enough power from the local electric company, so they also bought a 25-kilowatt generator.

A novel part of their apparatus, the chamber holding the material to be squeezed, consists of a cylindrical aluminum shell with a layer of refractory or

[*Continued on page 268*]

TRUE TEMPER Hammer News

[*Continued from page 266*]

heat-resisting powder bonded to the inner wall. A thick steel jacket surrounds it when it goes into the press. The appara-

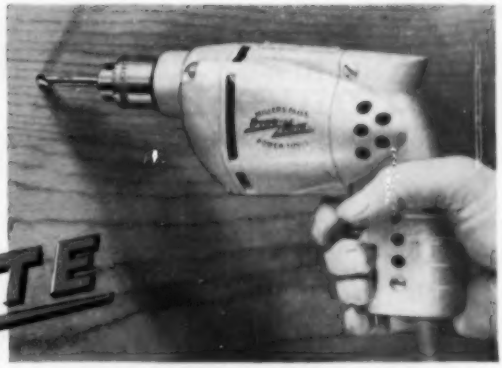
MORE POWER PER DOLLAR

with Millers Falls

DYNO-MITE

REGISTERED U. S. PATENT OFFICE

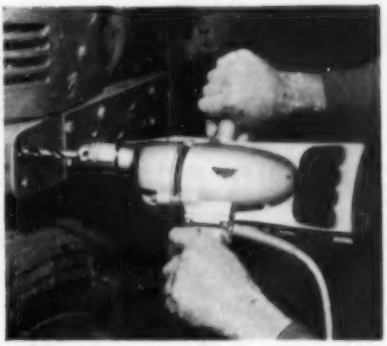
POWER TOOLS



LOADED WITH POWER and famed for performance, this Millers Falls ¼" Dyno-Mite Drill is the finest in its class. It's compact and light with a full 1.7 amp. rating — plenty of power for drilling ¼" in steel, up to ¾" and even higher in wood. Power to spare, too, for operating polishing bonnets, grinding wheels and many other attachments. **No. 1814, $22.35.**

When you buy power tools, make sure you get POWER — lots of it! Buy Millers Falls Dyno-Mite Power Tools. They're rugged, dependable and powered to handle the toughest kinds of jobs. And they're built with all the skill and quality that have made Millers Falls Tools world famous. See them at your hardware dealer's. Write, too, for free illustrated folders.

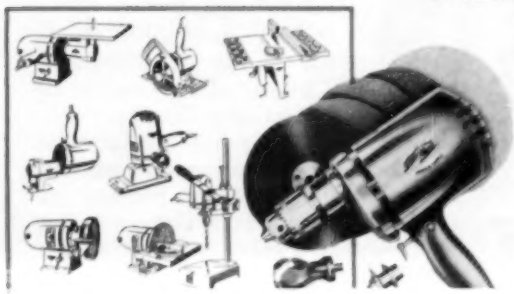
MILLERS FALLS COMPANY
Dept. PS-7 • Greenfield, Mass.



MOST POWERFUL DRILL of its type, this Dyno-Mite ½-inch Drill is an unbeatable buy. 3.0 amp. rating. Drills up to ½" in steel, concrete, masonry — up to 1" in wood — without stalling or overheating. Also ample power to operate hole saws up to 2 9/16" diameter. **No. 912, $40.95.**

DYNO-MITE ELECTRIC SAWS are real gluttons for work. Three great models. **No. 600** — a new, economically priced 6" saw with 1⅞" capacity, **$43.50. No. 610** — a husky, heavy-duty 6" model with a ½ h.p. motor, **$59.50. No. 700** — a larger, heavier saw that cuts up to 2⅜", **$67.95.**

DYNO-MITE POWER WORKSHOP



A sensational new multi-purpose tool that gives you the start of a complete power workshop for only **$39.95.** That's all it costs to own the No. 888 Dyno-Mite Power Unit that packs a full 1/3 h.p. and comes fully equipped as a ⅜" Drill, 6" Portable Disc Sander and 6" Polisher. Then, by adding inexpensive attachments, you can convert the 888 into a whole workshop of power tools including — an Orbital Sander, a 6" Portable Circular Saw, a Portable or Bench Jig Saw, a Bench Sander, a Bench Grinder, a Drill Press and a 6¼" Circular Bench Saw.

MILLERS FALLS TOOLS
SINCE 1868 ®

Now—your car can have modern power brakes!

[Continued on page 268]

TRUE TEMPER® Hammer News

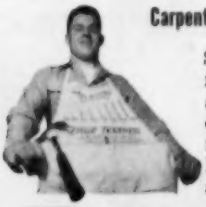
NEW KIND OF HAMMER

Head won't loosen; shaft won't break

R-R-R-RIP—pulling heavy nails won't bend or break the handle of the ROCKET hammer—it's a tube of boron alloy steel. The head is locked to the shaft—can't fly off, can't even *loosen*.

WHAM—when the hammer hits a nail, the hollow shaft and rubber cushion grip soak up the shock. It's the best-feeling hammer you ever swung and perfectly balanced, too.

Cushion grip won't slip even when wet or in gloved hand. It's bonded permanently to the shaft. See the ROCKET at your hardware store. $4.35*. Write for free folder. True Temper Corp., 1623 Euclid Ave., Cleveland 15, Ohio. *Slightly higher in West



Carpenter's Apron PROFESSIONAL QUALITY **Only 39¢**

Select a True Temper hammer and get this carpenter's apron for only 39¢. High-quality duck. Chart shows nail sizes. Practical, snappy. Limited offer, get yours now at your hardware store.

TRUE TEMPER®

Finest quality in hammers, hatchets and axes • Lawn, garden and farm tools • Shovels • Shears • Fishing tackle • Golf-club shafts

[Continued from page 268]

heat-resisting powder bonded to the inner wall. A thick steel jacket surrounds it when it goes into the press. The apparatus is so wired that electric current passes from the piston of the press through the contents of the cylindrical chamber. When Vilella wants, he can get a temperature of "better than 5,000° F." in his pressure chamber. He received a patent on this apparatus last November.

For diamond making, the chamber is about as big as a small thimble and is packed with carbon-containing material—burned sugar, in at least a few of the runs—"and some other things."

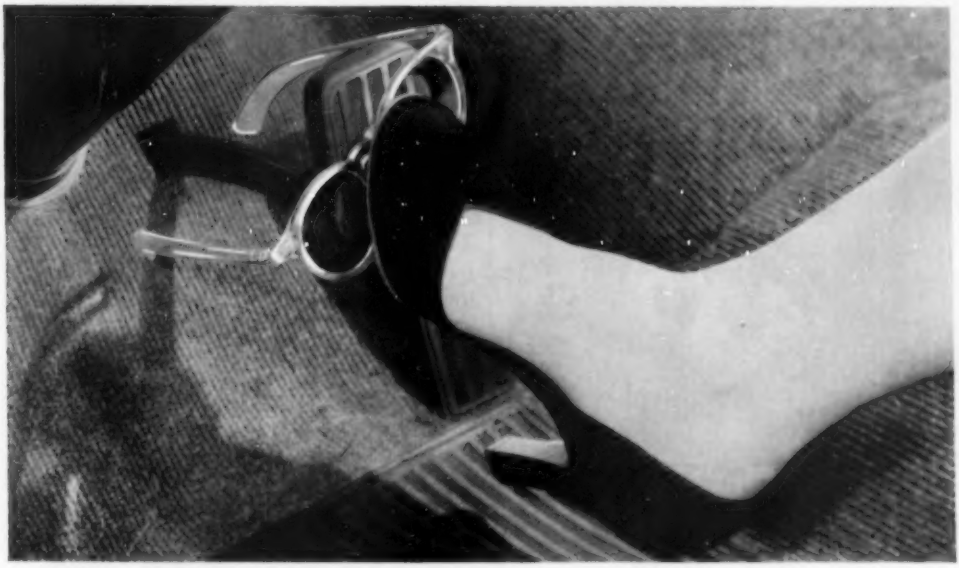
The cow-barn experimenters say they made their first diamonds in the fall of 1952—identifying them by tests of hardness, specific gravity, optical properties and resistance to acids. Later they delivered samples to Dr. H. F. Mark, Director of the Polymer Research Institute at the Polytechnic Institute of Brooklyn. Mark confirmed that the samples were diamonds by the test of micro-X-ray diffraction with single crystals (which was not known when Hannay and Moissan did their work).

This spring Vilella and Tomarkin demonstrated in a general way how their process works. Into an aluminum tube six inches long and 1½ inches in diameter, Vilella poured a mixture of powdered nickel and red phosphorus. He slipped the tube into a steel cylinder and placed the cylinder in the press. Tomarkin started up the generator, which filled the barn with a piercing, whirring noise. Vilella turned on the press and then the heating apparatus.

The ram of the press dropped slowly, and the needle on the gauge began to climb. When it reached the point marking the equivalent of a 75,000-psi pressure, it stopped, quivered. For some seconds the ram hung motionless, then suddenly plunged down perhaps another inch—an indication that the stuff in the pressure chamber had reacted and shrunk in volume.

[Continued on page 270]

Now—your car can have modern power brakes!



NOTE: "Spectacle test" above—proves easy action of MoPar Power Brakes! To demonstrate the small amount of pressure required on brake pedal to bring car to stop—eyeglasses were first placed on the pedal. Glasses were not damaged.

STAY SAFE—with brake replacement parts that are engineered especially for your car!

Service tip: *Play safe* with brake parts that *fit right and work right* in your Chrysler Corporation vehicle! Insist on parts provided in the MoPar Master Cylinder Repair Kit and MoPar Wheel Cylinder Repair Kit!

For cooler operating, safer brakes, get MoPar Heavy-Duty Brake Fluid!

MoPar Brake Fluid provides much greater protection against brake failure caused by overheated brake fluid because its boiling point is twice that of ordinary brake fluids.

MAY IS NATIONAL SAFETY MONTH —GET A MOPAR SAFETY CHECK!

New low-cost MoPar Power Brake Unit gives faster stops with half the effort—and it's easy to install!

If your car is "dated" for lack of power brakes, here's good news for you.

Now, you can enjoy the safety and ease of genuine power brakes just like those offered in the '55 cars.

Like thousands of other motorists, you'll find that a MoPar Power Brake Unit enables you to make the fastest, smoothest stops imaginable—with half the effort you'd normally use!

Today's finest power brakes are yours at a price to fit the most modest purse. Get your MoPar Power Brakes from your nearby Plymouth, Dodge, De Soto or Chrysler dealer or better repair shops everywhere.

MoPar is the name of parts and accessories designed especially for your Plymouth, Dodge, De Soto, Chrysler or Imperial car, or Dodge "*Job-Rated*" truck.

MoPar

PARTS DIVISION • CHRYSLER CORPORATION • DETROIT 31, MICHIGAN

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EASY Scotts® WAY

When it's weeding you're needing, ask your garden supply dealer about dry applied Scotts controls. Easy does it with these clean compounds . . . quickly applied with a **Scotts spreader** or scattered over the lawn with a wave of the hand from a shaker box.

4-XD® - low cost weed destroyer, a discovery of Scotts Research, it **kills Dandelions, Buckhorn, Plantain** and their ugly companions with no harm to grass.

Box to treat 50x50 feet of lawn - $1.75
BEST BUY — Big economy bag treats 11,000 sq ft - $4.85

WEED & FEED—Double witchery in this Scotts product, feeds grass to greater health and new beauty as it knocks out weeds.

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SCUTL® Crabgrass

with easy repeat treatments of this sure-fire control. Dry granules quickly broadcast with a Scotts spreader stop demon Crabgrass in its tracks. SCUTL also curbs lawn browning fungus disease while cleaning the lawn of Crabgrass. Box - $2.75 Bags - $5.45 and $9.95

Look for the famous orange and green grass design packages at your favorite **Lawn care®** *retailer — or drop a card to —*

O M Scott & SONS CO, *Marysville, Ohio*

Diamonds Are Where You Make Them

[*Continued from page 268*]

The two men threw switches. There was a sudden quiet. Vilella worked another control and a great puff of smoke filled the barn as the aluminum chamber popped out of the jacket and fell to the base of the press, where it flared brightly.

It was an eerie, almost diabolic, scene. The chemist admitted later that it need not have been so dramatic; ordinarily he keeps the chamber in the press until the contents cool. Then there is no flame.

But is there ever any danger? Vilella pointed to a row of windows 12 feet from the press. Chips from a steel pressure jacket had torn through two of them; other chips had gashed the walls.

Once the cylinder had cooled, Vilella cracked it open lengthwise with an ax head, knocked off the concretelike substance that had been the refractory powder, and exposed a rod of hard, glistening, pinkish metal. "Phosphor nickel," Tomarkin explained. "Highly resistant to corrosives. It has important uses if it can be made in quantity—and now it can be."

Using a heavier press, larger pressure chambers and more electric power, Vilella and Tomarkin expect to produce rare alloys on a commercial basis in the near future, and industrial diamonds—at a price low enough to compete with the natural product—within two years.

What about diamonds of gem size?

"You cannot help obtaining larger diamonds," Tomarkin answered, "when you have the optimum conditions under control." Said Vilella: "It's a matter of transforming *all* the material in the pressure chamber—not just some of it. We must experiment."

So the recurrent dream of laboratory diamonds seems to be coming true. But if you're looking for an engagement stone, you're still more likely to find it in a Kimberley mine. END

Net Profit

Experience: What you have left after everything else is gone.—*Hudson Newsletter.*

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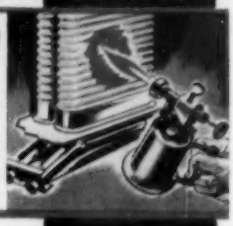
Won't Burn Out!

Tests show that repeated heatings up to 1200° F. have no damaging effect on this durable Janitrol construction.



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SURFACE COMBUSTION CORPORATION, COLUMBUS 16, OHIO
IN CANADA: ALYAR SIMPSON LTD., TORONTO 12.

That Wonderful Machine on Your Wrist

[*Continued from page 147*]

finishes, but that, synchronized with the starter's pistol, set down exactly the time elapsed.

All these are useful watches. The Swiss have also made many play pieces. When Farouk was king of Egypt he had a watch filled with birds that sang. There are watches in which duelists, clashing swords, pause to indicate the hour; others with revolving spinning wheels, a blacksmith hammering at his forge, a man and a woman kissing. One of the most famous shows a shepherd under a tree playing pipes while cupids swing to and fro, a dog barks, sheep bleat, and a girl beats time on a carillon as she reads from a score.

The smallest watch the Swiss have developed is about the size of a match head. This pigmy instrument has been fitted into perfume-bottle corks, pencil ends, earrings and belt buckles. Once an African chief ordered one because he wanted a watch small enough to put into one of his gold teeth.

Although the watch of today is an extraordinary mechanism, the search for the absolute goes on—the timepiece that needs no attention, that will never lose or gain, that cannot break or stop. There are already electric and, even better, electronic watches. The tiny transistor promises an application to timekeeping. But whatever improvements the future may bring to the watchmaker's art, the Swiss intend to keep on ticking their way to world leadership. END

He Asked for It

The car pulled up to a gas station and the attendant cleaned the windshield, put in gas and oil, watered the radiator, checked the pressure of all the tires and brought cold water for the children.

"Will there be anything else?" he asked politely.

"Yes," said the woman behind the wheel. "Will you please fold my road map?"—*Pure Oil News.*

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Weldwood knotty pine paneling makes it easy to change an attic, basement or storage room into the cheerful work, play or guest room you see here. And see how little it actually costs!

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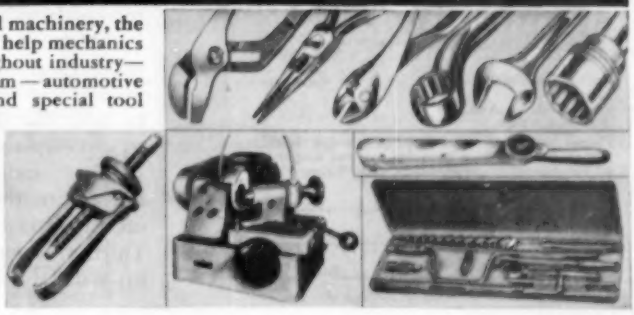

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Can Science Stop Dust Storms?

[*Continued from page 165*]

not helpless. He can plow his bare, dry land down six to 12 inches and bring up clods from the subsoil. Clods not only slow the wind but make nestling places for small dirt particles. The wind tunnel has shown how, by using different types of crop rotation, a soil loss equivalent to 74,000 pounds an acre can be reduced to a loss of only 970 pounds an acre.

Back at their laboratory in Manhattan, the scientists continue their studies in a second, bigger wind tunnel, 56 feet long.

Artificial barriers and shelter belts of trees and shrubs are set up inside—in miniature. In this tunnel, a solid wall, four inches high, didn't faze the wind;

> ***All we need to do to make good drivers out of the womenfolk is to teach them to be as careful about curves when they're driving as when they're getting all dressed up.***
>
> —THE SIDEWALK SUPERINTENDENT

it jumped over and struck the ground on the other side. A wall with an opening at the bottom did more to stop the wind. By working with tiny snow fences in the tunnel, it was shown that ordinary snow fences, four feet high, spaced 40 feet apart, would reduce wind velocity by about half.

The Manhattan soil men indicate that the ideal solution would be a conditioner that makes the soil resistant to blowing. The most promising is an asphalt emulsion that is sprayed on the land. It gives complete protection, but is too costly to be practicable.

Another suggestion is that farmers make their own wind-resisting clods by mixing and pressing soil. The problem is to find the right moisture content and to develop tools. It is being worked on.

Zingg and Chepil are hopeful that, before another severe drought brings on tragic dust bowls such as those of the Thirties, their wind tunnels will come up with the right answer. END

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GRIND-A-LEAF *attachment for Bolens gasoline rotary power mowers pulverizes leaves and eliminates raking.*

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AND YOU'LL DO THIS!

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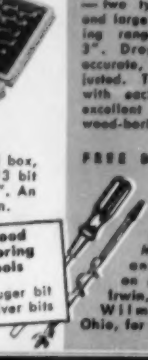

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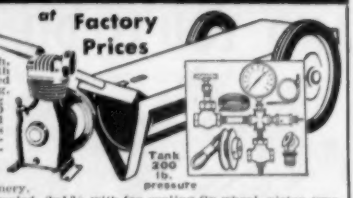

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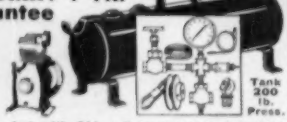

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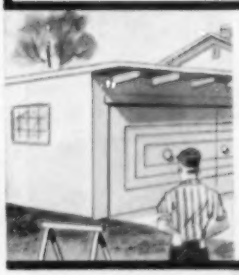

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This famous 2 h.p. rotary tiller will till and prepare soil and cultivate between the rows. ROTO-HOE owners by the thousands are "AMERICA'S HAPPIEST GARDENERS." And, best of all, ROTO-HOE costs only $134 complete. Many "customer-proven" attachments do extra jobs, all are low in cost. Get all the facts today.

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If you're handy with tools, you may be able to start a profitable part- or full-time business selling and servicing ROTO-HOEs. Write for details.

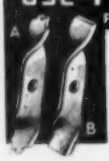
ROTO-HOE & Sprayer Co., Box 18, Newbury, Ohio

"America's Leading Manufacturer of Lawn & Garden Equipment."

Guaranteed original equipment Replacement Auto Parts . . . at Western Auto

USE YOUR BENCH SAW

FOR JOINTING & CUTTING MOULDINGS



With our six inch tool steel cutters you can make beautiful mouldings for picture frames, furniture, and house construction. Cutters as shown.

DIRECT FROM FACTORY!

One inch wide—$1.98; 1½ inch wide—$2.49 ea. Postpaid. Guaranteed. List & Folder free. State hole size.

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NEW KING MIDGET for 1955, lower priced, improved performance. Drive it for 75¢ per week. Rider agents wanted, earn your own car. Also just out **King Midget Junior** chassis, finely engineered, ready to run, and priced at less than the retail cost of parts. Agents wanted. Get all the facts—send 25¢ for literature, special prices and proposition on both cars, or $1 (refunded first order) for this plus actual assembly book and service manual.

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For easier work, better results— use these high quality

D-P COMPOUNDS!

D-P Glazing Compound

D-P Caulking Cartridge

- For glazing all sash—wood or metal.
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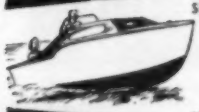
FOB Pulaski, N. Y. Cash, Check or M. O. Money back guarantee

UNITED STATES FORGE AND FOUNDRY CO
CONSTRUCTION EQUIPMENT DIV. PULASKI NEW YORK

BOAT KITS



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(DEALER INQUIRIES INVITED)

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Clean your carburetor with GUMOUT

One big cause of high gas consumption is a dirty, gummed-up carburetor. When tiny gas and air passages become clogged, the fuel-air ratio is upset. The carburetor *can't* function right. And there is no adjustment you can make to compensate for dirt and gum! The carburetor must be cleaned!

But—the carburetor doesn't have to be taken apart to clean it!

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Send for FREE 46-page Carburetor Handbook. Gives you all the answers. Good to have.

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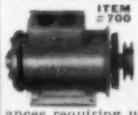
FOUR-WAY OPEN CENTER
HYDRAULIC CONTROL VALVE

ITEM #126 — Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has ¾" pipe thread inlet and outlet. ½" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10½ lbs.

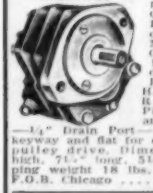
AN OUTSTANDING BUY! F.O.B. Chicago **21.50**

BELT DRIVEN
A. C. GENERATOR



ITEM #700 Ideal for powering electric tools, oil burner, refrigerator, lights, or other appliances requiring up to 700 watts of power. 700 watts, 115 Volts, 60 cycles A.C. 3600 R.P.M. Compact, self-regulating generator with V Belt pulley and double outlet receptacle. Rotation counter-clockwise. May be driven by tractor or auxiliary gasoline engine. Requires 2 HP minimum. Dimensions: 10" long x 8" high x 6" wide. Shipping wt. 27 lbs. F.O.B. Chicago **59.50**

MULTI PURPOSE
HYDRAULIC PUMP OR MOTOR



ITEM #55 Silent, high efficiency, Helical Gear Type Ball Bearing, Hydraulic Pump or Motor. Rated 8 Gal. Per Min. At 1500 R.P.M.—delivers 1000 P.S.I. Using 6 H.P.—Reversible Rotation—¾" Pipe Thread Inlet and Outlet Ports—¼" Drain Port—¾" shaft with keyway and flat for either direct or pulley drive. Dimensions—5⅜" high, 7½" long, 5⅛" wide. Shipping weight 18 lbs. F.O.B. Chicago **45.50**

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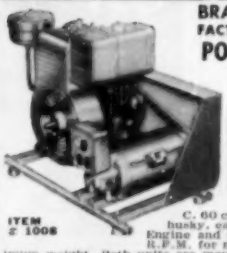

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- 8" Electric Saw, Electric Drills, Pipe Bender.
- Refrigerator, Deep Freezer, Incubator.
- Water Pump, Radio, Lights, Air-conditioner.

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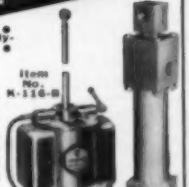

Item No. M-116-B

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1—Brand new Blackhawk Model P-151—Hydraulic hand pump with built-in oil tank and release valve. Rated from 1200 P.S.I.—to 8400 P.S.I. 20" handle. Dim. 8"x6"x6". Item #82 ..... 22.50
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All necessary hydraulic fittings.
Total ship. wt.—40 lbs.
COMPLETE KIT PRICE **38.95**
ALL OF ABOVE INCLUDED F.O.B. Chicago

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with FINGERTIP CONTROL

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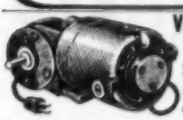

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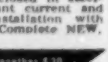

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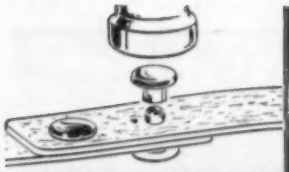

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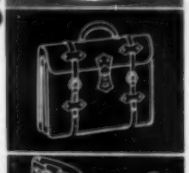

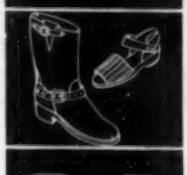

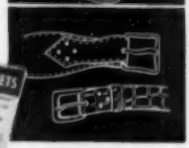

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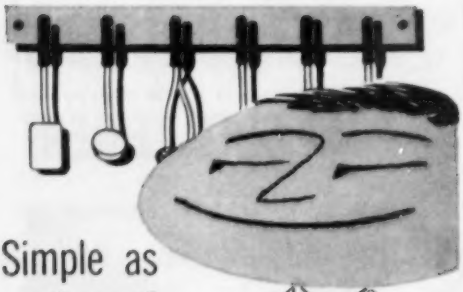

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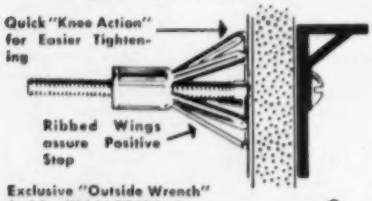

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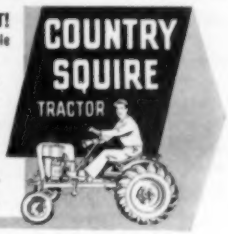

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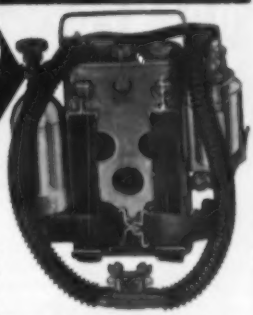

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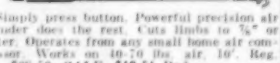

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Ask your dealer for Simplified Directions for Installing Stanley Garage Hardware and Easi-Bild Pattern. Or use coupon below. *Trade Mark Reg. U.S. Pat. Off. — Easi-Bild Pattern Co.

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TILT/ARBOR SAW

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GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jackscrew mechanism and handwheel, and all other metal parts (less blade)..... **$22.95**
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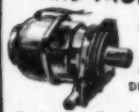

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MOUNT ALONE (without scope) **15.00**

Scope and Mount, BOTH **24.50**

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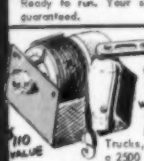

110 VALUE

WITHOUT MOUNT

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WINCH HOIST – Same as above with a free-spool, pull-out clutch. **29.75**

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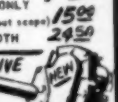


NEW

For use where tremendous power at low take-off RPM is desired. 6 gears rotate on self-lubricating, hi-speed roller bearings. 85 to 1 gear ratio. Shafts are 1¼" & 3/8" dia. All NEW! **12.95** NEW

ARMY PORTABLE WINCH HOIST

NEW

LIFTS 1500 POUNDS Made for U.S. Navy Bureau of Ordnance as a Bomb Hoist. Has a 21 to 1 gear ratio. 40" tubular arm extension with a 3" pulley on the end. Drum has 12 ft. of 3/16", high tensile strength steel cable. The operating handle has a ratchet brake. Ideal for 'swing about', truck or platform loading. A $125.00 Surplus Value. **22.50**

IN STOCK AGAIN VICKERS HYD. TRANSMISSION

Self-contained, constant torque at all speeds with variable volume, reversible piston pump which supplies piston hydraulic motor. Has 2 H.P. Automatic pressure dash pot for smooth control. Power output RPM – 0 to 1/3 input RPM in both directions. Input RPM 1800 continuous, 4000 intermittent. Ideal for Lathes, Duplicator setup on Mills, Conveyors, Small Cars, Drives, etc. NOW **44.50**

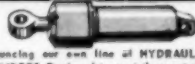
4" SPLINE SHAFTS for input and power take-off on above. Pair $2.50

INPUT & TAKE-OFF PLATE ASSEM. To adapt Trans. to pulley drive. Has 1/2" keyway shaft. High speed bearings. Set $20.00

PESCO HYDRAULIC PUMP ONLY 14.95

A gear type pump. Will deliver 2 gal. per min. at 1500 RPM with 1500 PSI. Delivers 6 gal. per min. at 4300 RPM with 1500 PSI. Has .375 cu. in. displacement per rev. 3/4" standard pipe ports. 5/8" male spline drive shaft. 4" pad mount.

SAVE 50% ON NEW PALLEY HYDRAULIC CYLINDERS



Announcing our own line of HYDRAULIC CYLINDERS. Designed to meet the most rigid requirements. ALL STEEL with "O" rings. 1500 and 3000 PSI. Full stock of replacement parts available. We also Custom Build in any size to your specs. Write for full details of our entire line or see examples below . . . .

BORE	STROKE	SHAFT	PSI	PRICE
3"	4"	1-1/8"	1500	$32.50
4"	5"	1-1/8"	1500	$37.50
4"	5"	1-1/2"	3000	$52.50
5"	18"	2"	3000	$85.00
5"	30"	2"	3000	$ 130.00

AIR ASSOC. TE 870M1 HYDRAULIC TEST STAND

COST GOV'T APPROX. $6000

Electric motor driven type. Has 2500 PSI Hydreco Pump which delivers up to 10GPM. Powered by 15 HP, 3 phase motor which operates on 220/440 V, 60 cycle current. Unit has selector valves, pressure gauges, flow meter, reservoir, heat exchanger and filter pressure regulator. Mounted on steel frame. Has work bench, flourescent lights and hand operated, high pressure pump for high pressure testing. Size: 8 ft. long x 7 ft. high x 4 ft. **$1495**

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NEW

Has built-in adjustable relief valve, set at 1000 PSI. Spring loaded neutral position. For use with one double action cylinder as shown above. May be mounted in series. Has 3/4" pipe, inlet & outlet. 1/2" pipe thread cylinder ports. Shipping weight 10½ lbs.

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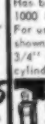

No. 29 HYDRAULIC CYLINDER – will give 20,000 lbs. thrust using 1500 PSI line pressure as delivered from our hydraulic pumps. Gives up to 40,000 lbs. thrust with 3000 PSI. Has 4" bore; 18" stroke; 30-1/2" long. . . . . USED 29.95 NEW 43.95

NOTE: Send for Catalog of our entire stock of Hydraulic Cylinders, Valves, Pumps, Motors, Tubing, Fittings, etc. Save NOW!

SAVE UP TO 50% BUY FROM IMPORTER

GENUINE SELECT PHILLIPINE MAHOGANY LUAN PLYWOOD

Ideal For Fine CABINET WORK, FURNITURE, Paneling DENS, OFFICES, HOTELS, etc.

Our prices are LESS THAN DOMESTIC PLYWOOD at WHOLESALE. This selected LUAN MAHOGANY meets the most rigid specifications. It is WEATHER and WATER RESISTANT. You'll be amazed at the beauty of this fine wood. Its rich golden elegance will thrill you. Rotary cut for beauty of grain. Both sides sanded and ready to use. Bonded with finest resin adhesive. Face side unjointed.

See for YOURSELF FREE SAMPLE on request!

All orders shipped by special truck for LOWEST rates. No order accepted for less than 100 lbs. . . . . (4) ¼" sheets (8) ⅛" sheets

3 ft. x 6 ft. x 3 mm approx. 1/8" 18 sq. ft. A 35.00 VALUE **1.79** FULL SHEET Min. order 8 sheets

4 ft. x 8 ft. x 1/4" 32 sq. ft. A 89.50 VALUE **4.49** FULL SHEET Min. order 4 sheets

3400 RPM ½ HP POWER SAW 19.98

NEW

Compares to saws selling up to 49.50

Complete with 5⅛" Blade

CUTS THROUGH A FINISHED 2 x 4 LIKE A KNIFE THROUGH BUTTER RIPS-CROSSCUTS

A rugged, professional type, adjustable saw. Cut any angle, 0 to 45°. Has adjustable (0 to 6") rip fence. Safety-trigger switch on handle. Full ½ HP Universal AC-DC, 110-120 Volt, 60 cycle motor. Weighs only 6½ lbs. A sensational Value – We sold over 700 Saws in Los Angeles in one week.

EXTRA SAW BLADES – Available in Rip, Crosscut or Combination. Please specify . . . . price each . . **2.95**

SPORTSMAN'S 12 Pc. IMPORTED COMBINATION KNIFE

Complete with Genuine Leather Holster!

NEW

Eliminates 12 Individual Items from your Pack or Tool Kit!

(A $12.95 VALUE) **4.95**

COMPLETE CAMP KIT

Here is the Perfect, Combination Knife-Tool for every Outdoor Sportsman, Hunter, Camper, Fisherman, Boy Scout, Ranger, Rancher, etc. Think of it! 11, Fine quality Steel Tools, precision made to fold easily into the heavy bone covered body. In one neat, compact unit you have (1) a regular knife, (2) a fork, (3) a spoon, (4) a draw-knife, (5) a bone-saw and fish-scaler, (6) scissors, (7) a can and bottle opener, (8) a cork-screw, (9) awl punch, (10) a screwdriver and (11) a metal file. All this PLUS a genuine leather belt holster.

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As seen in Popular Science. Save up to $100. Our fully illustrated instructions show how it's done. Included in one 2 Air Bottles (1 hour air supply), Pressure Regulator, Hose, Shoulder Harness, Safety Belt, Clamps, Mouth Piece, Valves, etc. FREE – with each order **45.95**

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A pair of Navy Swim Shoes to protect feet from coral, rocks, etc. Give shoe size. . .

NEW MEDUSA DIVING MASK

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Specially designed to bring the lens close to eyes. The mask's Pinocchio nose allows you to grasp it between the fingers & blow out to relieve pressure on the ears. Special lens is 3/16" tempered safety glass. Be the first to own this fine Italian import. Guaranteed! **5.95**

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[*Continued from page 122*]

long range, where high speed is not the main factor. Thus the turboprop may very well become tomorrow's workhorse of the air.

U.S. turboprop engines have all been designed for the military. They power (mostly experimentally or for service tests) many types. These include a version of the C-124 Douglas Globemaster, a 200-troop-carrying monster; the 40-troop Piasecki H-16 helicopter; an F-84 fighter, replacing jet power to see how it works; the two Navy VTO (Vertical Take-Off) planes. These are powerful engines, perhaps too powerful for economical use by commercial airlines.

Three engine manufacturers, however, believe that they now have turboprops, modified from military versions, that can be used to power commercial transports.

• Allison Division of General Motors recently announced that it was making a commercial version of its military T56 turboprop engine available to U.S. airlines and airframe manufacturers. They claim that this Model 501-D10, developing 3,750 horsepower, could raise the speed of a four-engine airliner to 450 miles an hour. That is about the speed of the British Comet I jet, and is faster than the P-38 Lightning fighter of World War II.

• Pratt and Whitney has a PT2 turboprop, a commercial development of its 5,700-horsepower T34 military engine. The PT2 is being considered for Lockheed's 1449, a Super Constellation modified as a turboprop airliner.

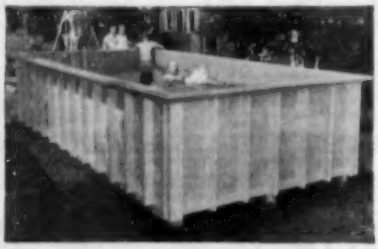
• Curtiss-Wright's T49 military turboprop puts out more than 10,000 horsepower. It is so powerful, and so efficient in using its power, that two of them, flying experimentally in a six-engine B-47 Stratojet bomber, replace four J47 jet engines. (A single J47 jet packs an equivalent of about 6,000 horsepower at 375 miles, and more than that at high speeds.)

That's a lot of power for an airliner to take on. You wouldn't want it, you couldn't use it, the airplane couldn't handle it. Roy T. Hurley, president of Curtiss-Wright, agrees, but he has a simple solution: Down-rate the T49 for commercial use; gear it down so that it could put out no more than two-thirds, or even less, of its maximum capability.

As commercial power packages, however, these U.S. turboprops, like several new British ones, are not yet in actual production. Even if orders came right now, it is doubtful that they could go into airline service for about three years. This means that Capital's and Trans-Canada's new Viscount turboprops will meet no competition in this country until 1958.

By that time, there may be a jet flying a U.S. airline. Boeing recently announced that orders placed this spring for a commercial version of its 707 jet transport could be delivered in 1958. END

NEXT MONTH ... How to Build a Plywood Swimming Pool



NAIL standard-size sheets of waterproof plywood to a framework of two-by-fours, calk the joints like a boat and you've got a swimming pool. No need to break your back digging a hole, for the pool stands aboveground. For all the details on how to do the job, be sure to see the June issue of POPULAR SCIENCE MONTHLY. The cost? Just a little over a hundred dollars. Time required? Two weekends.

HIGH PRESSURE FOUNTAIN BRUSH

WASHES CARS LIKE MAGIC WITH ROTARY POWER SPRAY

SAVE $3.00 FROM FACTORY-TO-YOU

$1.98 COMPLETE KIT

A SPARKLING CLEAN CAR YOURS . . . IN 7 TO 10 MINUTES

NO HARD LABOR! NO FUSS! NO MESS!

BUILT-IN SUDS CHAMBER!

Reg. 4.98

NEW 3 WAY FOUNTAIN BRUSH WASHES CARS, PORCHES, FLOORS, SCREENS, WINDOWS—QUICK, EASY!

Now . . . Order your famous **AEROMAT FOUNTAIN BRUSH** direct from the factory and save $3.00. Thousands sold last year at much higher prices. The new, improved 1955 model is better than ever—gives you quicker, more thoro washing action. Simply attach it to your garden hose and wash your car sparkling clean in 7 to 10 minutes! Wonderful for household chores also! Washes screens, windows, venetian blinds, floors, walls, tile, awnings, porches, outdoor furniture. So thoro—so quick—so easy!

ROTARY HIGH PRESSURE ACTION WORKS FOR YOU!

The **AEROMAT** has a built-in suds chamber. Drop in a "Magic" Detergent Pellet supplied with your brush, turn on the water and glide it along your car! No hard scrubbing. No back straining. You take it easy while the high pressure **ROTARY SPRAY ACTION** loosens and removes all road film and dirt. It's easy . . . it's fast . . . it's fun!

3 SECTION TELESCOPE HANDLE LIKE 3 BRUSHES IN ONE!

NEW for **1955**—a 3 section fountain handle—makes the new model **AEROMAT** handier than ever. Each section is one foot long. Use 3 sections for washing cars, walls, windows. Use one or two sections for other work. Easy to store away or take along when you travel! **STAR FEATURE**: Bristles are made with the new miracle product—**DUROSTYRENE**—soft as silk, cannot scratch or mar paint—yet it lasts for years and years!

COMPLETE KIT—ONLY 1.98

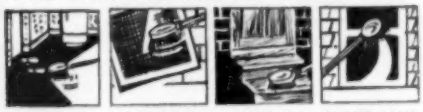
Includes Brush, Handle, Suds Chamber, Magic Pellets and Carrying Case

You get everything you need, ready for **INSTANT** use—nothing else to buy. Try an **AEROMAT** kit now—without risk. Send only **1.98** m.o., check or cash for immediate delivery. Or order COD plus 44 cents postage. **RUSH COUPON AT ONCE!** Quantities limited. First come, first served. Get yours direct from the manufacturer and save over half! Your money back quick if not 100% satisfied!

SEE IT IN ACTION! TRY—BEFORE YOU BUY!

Use, try, test an **AEROMAT** any way you like for 5 days. See the **ROTARY SUDS ACTION** thru the **VISIBLE HEAD.** See how it dissolves road sludge and dirt with practically no work! Then, if you're not thrilled in every way, return to our factory for immediate refund of your 1.98—no questions asked! Rush coupon now for free trial—no obligation. It's not a sale until you've tried it and agree it's simply amazing.

USE FOR ALL HOUSE WASH JOBS!



FLOORS SCREENS WALLS WINDOWS

FREE TO YOU 10 CAR WASHES!

Yours free of extra cost—a generous trial supply of **AEROMAT "MAGIC" SUDS PELLETS**—enough for 10 car washes. Place in built-in chamber. As water flows through, pellets foam into suds. Road film dissolves and slides off. Leaves no streaks! Never mars finish. Free package contains enough pellets for 10 car washes. If you paid only $1 per wash you would save $10. Extra packages available: Regular Size for 12 washes: 59 cents. Large size washes 24 cars, costs only $1.

MOTO-MATIC COMPANY
352 Fourth Ave.,
Dept. 7-E-444,
New York 10, N. Y.

3 FOOT TELESCOPE HANDLE
3 sections! Make it Long or Short

***RUSH!* for COMPLETE KIT**

. . . ON 5 DAY APPROVAL . . . Copyright 1955, M-Matic Co.

MOTO-MATIC COMPANY,
352 Fourth Ave., Dept. 7-E-444, New York 10, N.Y.

RUSH.....Aeromat Washer Kits, Complete with Carrying Case, Brush, Head, Suds Chamber, 3 handles with all fittings, complete for **1.98** each—on **5 DAY TRIAL—MONEY BACK GUARANTEE.** I'm not buying—I'm trying. If I am not delighted, you will refund my **1.98** at once.

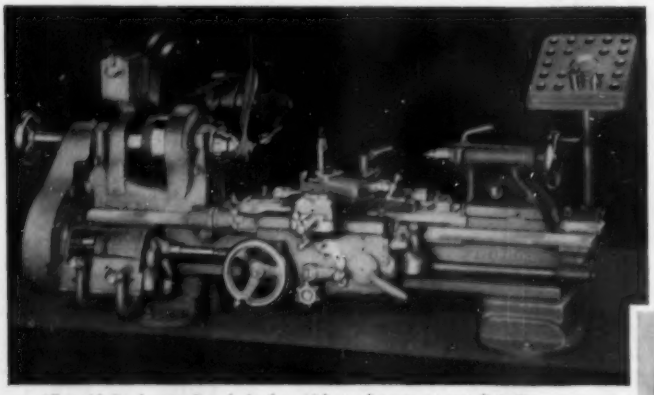
☐ 1.98 enclosed—RUSH all postage paid. ☐ Send COD plus 44c postage.

Name.....

Address.....Town.....State.....

☐ ALSO send.....Large Size package of magic pellets at $1. each—enough for 24 car washes.

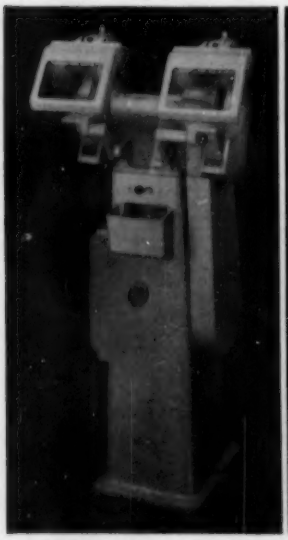
☐ Send.....pkgs. reg. size at 59c each for 12 washes.



9" x 3' Toolroom Bench Lathe with toolroom attachments, less electrical equipment, f.o.b. factory, $608

South Bend

Built Better TO GIVE YOU A Better Buy



8" Pedestal Grinder with wheels and lights but less motor, f.o.b. factory, $245

7" Bench Shaper with light, vise and pressure lubrication but less metal bench and motor, f.o.b. factory, $551

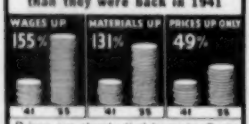
South Bend Machine Tools contribute to the skill and ability of the most expert technician because they are a match for the most exacting tolerances required. Versatile and easy to operate they enable you to do more and better work. Quality built throughout, they represent maximum value at minimum cost. Regardless of the kind of machine work you do, it will be to your advantage to learn more about South Bend. Mail coupon for complete information without obligation.

TIME PAYMENTS

only 3¼%

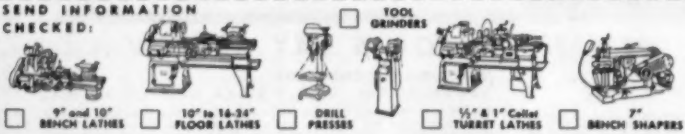
annual interest on original unpaid balance. Low down payment and monthly installments.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941



Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

SEND INFORMATION CHECKED:



☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ TOOL GRINDERS ☐ ½" & 1" Collet TURRET LATHES ☐ 7" BENCH SHAPERS

Name_____ Street_____

City_____ State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

CONDITIONAIRE VENTILATING FANS

Save big money installing your own exhaust fan. Efficient propellor type blade moves huge volume of air quietly and effortlessly. Heavy welded frame — predrilled for easy installation. Just cut opening and bolt in place. **Continuous duty** motors. Ideal for attics, restaurants, garages, barns, chicken houses, etc. Control manually or with thermostat.

Blade	Opening	CFM	Wt.	Item	
16"	18¼"	2925	19 lb.	365a	$27.95
18"	19¼"	3600	27 lb.	365b	$31.95
20"	21⅛"	4100	30 lb.	365c	$30.95

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).

8" Pipe, wt. 5 lb. $6.95
9" Pipe, wt. 6 lb. $7.85
10" Pipe, wt. 7 lb. $8.85
12" Pipe, wt. 8 lb. $9.85

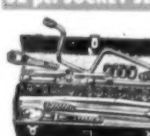
HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E) $11.95
12" Fan, wt. 10 lbs. (Item 10D) $12.95

EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable, 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **$8.95**

NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs. $6.95. 100 ft. (Item 200) $12.95

52 pc. SOCKET SET

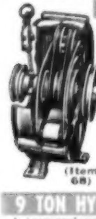


Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job: in a big doghouse steel box. Wt. 17 lbs. (Item 205)
List price $62.90. Factory special.. **$27.95**

FLASH-WELD SOLDER GUN

High powered double transformer soldering gun that converts ordinary 115 v. current to instant heat for big soldering jobs! Installs or removes copper pipe fittings in two seconds! Applies solder lugs, heats tools for hardening, provides heat for continuous sheet metal soldering. Saves at least 50% labor time. Includes complete heating unit transformer, heavy cables and grip type soldering pliers. Wt. 38 lbs. (Item 777) Reg. $79.50, Close-out **$39.50**

Variable Speed Selector



(Item 68)

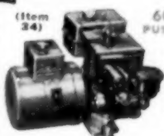
Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "trouble free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes: ½-1 hp. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs.; Reg. list $228, $252 and $352. Our prices ......
$79.50, $89.50 and **$114.50**

9 TON HYDRAULIC PRESS

A tremendously powerful hydraulic press, capable of exerting 18,000 lbs. pressure. Pays for itself many times over—straightening bent connecting rods, king pins, crankshafts, axles, link pins and bars — or pushing out frozen bearings and bushings. Developed pressure under precise control and visible at all times on accurate gauge. Complete with both large and small anvils and jigs to straighten **any** kind of curve or bend. (Item 464) Wt. 110 lb. Actual list price $365. Our special close-out price.... **$69.50**

get BEDROCK factory prices from MASTER MECHANIC

600-700 WATTS
PUSH BUTTON START

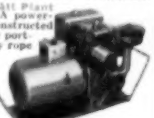


(Item 24)

115 v. 60 cyc. AC Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. $275 value.... **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output........ **$199.50**

MASTER-LITE 2500 Watt Plant
110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price $645.00
(Item 21) Factory Price **$329.50**



(Item 21)

3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33⅓% more capacity. Wt. 270 lbs. Reg. $760. Factory Price.............. $379.50

Dual Voltage 110/220 available for above plants for $30.00 additional.

We make every type and size of light plants—
Write, giving us your requirements!

JET STEAM MASTER

Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 463.
Special factory price........... **$329.50**

HI-FLO Centrifugal PUMP

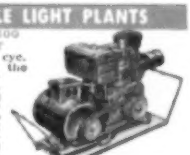
Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. ! . . Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Prelubricated sealed bearings for years of heavy low-cost service. **Big 1½" Model.** Item 502. Wt. 70 lbs.
Factory price.... **$134.50**
2" Model (150 gal. per min.) with 2½ HP engine. Item 502a. 90 lbs. Fact. Spec. $154.50

BIG JOE Portable Pump

A powerful pump that handles up to 15,000 gal. per hour. Easy to operate. Self-priming (after initial prime), no foot valve needed—resulting in 25% more capacity. Exclusive impeller design provides maximum rate of water per horsepower, yet handles water containing a large percentage of stone, gravel and mud. 2 in. suction and discharge. Powered by an **easy starting 6 hp. Wisconsin engine** and mounted on big rubber tired wheels. Wt. 280 lbs. (Item 280).
Special Factory price.......... **$299.50**
Same pump mounted on steel skids. Wt. 250 lbs. (Item 503).
Factory price................ **$275.00**

PORTABLE LIGHT PLANTS

GIANT 2000-2500 WATT PLANT



110-120 v. 60 cyc. AC absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb.
Reg. price $585. Special at..... **$299.50**
Same plant with electric self starter (Item 31a).......... **$359.50**
Generator only and control box.... $169.50
DUAL VOLTAGE 110-220 available on any of above models for $28.00 additional.

JET FLOW BLOWER

Tremendous air movement (1800 CFM) and quiet operation make this double inlet 10" turbine blower unbeatable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any ¼, ⅓ or ½ HP motor. Oversized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" hi x 18" x 16½". Outlet opening 13" x 11⅜". Wt. 45 lbs. Item 245. Reg. $54.50.
Factory Special.................. **$27.50**
HEAVY DUTY ½ HP motor for above $16.95
12" TURBINE BLOWER Similar to above, but larger with 2400 CFM capacity. Wt. 65 lbs. (Item 245a) Reg. $70.00. Factory Spec. $34.50

SELF-PROPELLED MASTER GARDENER

It's a lawn mower — It's a rotary tiller
It's a power sickle — It's a bulldozer
It's a cultivator — It's a snow blower

(Item 601)

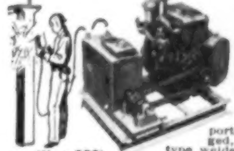
Tractor shown with Rotary Mower Attachment

New! with **power reverse!** Improved Master Gardener with new extra power and a full gear transmission—providing forward, neutral and POWER REVERSE! Works for you the year 'round. Does terrific job of cutting grass or weeds, or prepares mellowed deep seed beds without labor. So well balanced that any woman can easily handle it. Has two built-in clutches controlling motion and implement drive. New gear tread tires assure nonslip drive. Performs better—does more than tractors costing twice as much. Converts in minutes to Tiller, Sickle, Power Mower, Snow Blower, etc. Basic self-propelled tractor with famous 2½ hp. Clinton engine complete with rewind starter. Wt. 110 lbs.
Special................................ **$129.50**

Cultivator ..... $18.75 Rotary Tiller.... $49.50
Furrowing Plow $9.75 Disc Harrow...... 15.75
Snow Blow.... $39.50 Dump wheel barrow 49.50
Rotary Lawn Mower 39.50
Sickle Bar Mower 49.50
Lawn Mower Hitch 4.75

Easy payment plan available. Freight paid east of Rockies—half paid elsewhere.

MASTER DC ARC WELDERS



(Item 280)

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 3" plate using from 1/16" to ¼" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.

WELDER ONLY — DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a.) Wt. 110 lbs. $450 value......... **$119.50**

WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.)
Wt. 110 lbs. $400 value. Special.. **$99.75**

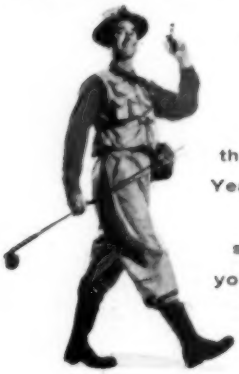
COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing $1200.
Factory Special................ **$449.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **$10.50**

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10¢ for... BIG 1955 Catalog
MASTER MECHANIC MFG. CO., DEPT. [illegible] Burlington, Wis.

For more pure pleasure... **have a Camel!**

No other cigarette is so rich-tasting yet so mild as CAMEL!



● THIS you'll notice about Camel smokers: they get more pure pleasure from smoking! Year after year, Camels lead all other brands. No other cigarette is so rich-tasting, yet so mild! Make your own 30-day Camel Mildness Test. Find out for yourself how wonderfully Camels agree with you!

R. J. Reynolds Tob. Co.
Winston-Salem, N. C.